Mobile technology and cultural heritage organisations: an examination of current practice (with special reference to the West Midlands)

by

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Summary

The purpose of this dissertation is to determine whether, why and how mobile technology is being used by archive services, and how this compares with the approach taken by libraries and museums.

Focusing on the geographic area of the West Midlands, and using a mixed-methods approach of a survey questionnaire and semi-structured case study interviews, the research objectives are to: identify the extent and nature of take-up of mobile technology; obtain opinions from practitioners of the perceived and potential usefulness of the technology within the cultural heritage sector; determine why and how mobile solutions have been adopted; compare and contrast approaches within the different segments of the cultural heritage sector; and recommend good practice for future mobile developments by archive repositories.

The study found that the level of mobile activity is low compared with organisations' engagement in social media and other online services. There are comparable levels of activity across the cultural heritage sector but significantly less is published about archives and mobile technology. Lack of capacity, staff expertise and financial pressures are limiting factors for mobile engagement but partnership, external funding and re-purposing existing data offer potential for future projects.

The study found that broadly speaking: museums are most likely to focus on 'edutainment' experiences for visitors; archives are most likely to be concerned with resource discovery by intending visitors; and libraries are most likely to be active in enabling mobile transactions for remote users. However, collaborating to develop services blurs these simplistic boundaries. Any mobile services must have a sound strategic base in user requirements, anticipated demand and service priorities. Mobile services are not stand-alone but one element in a range of access points and should be integrated into service provision. As such, a mobile-optimised website should become a minimum standard level of service.

Declaration

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

Signed …… (candidate)

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STATEMENT 1

This work is the result of my own investigations, except where otherwise stated. Where *correction services have been used, the extent and nature of the correction is clearly marked in a footnote(s).

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Abbreviations

API	Application Programming Interface
AR	Augmented Reality
ARA	Archives and Records Association
CILIP	Chartered Institute of Library and Information Professionals
IADIS	International Association for Development of the Information Society
LMS	Library Management System (*software used to manage library catalogues and associated transactions (e.g. issue/ return of items, reservations))*
MP3	MPEG audio layer 3 *(a compressed audio file)*
NFC	Near-field communication (*short-wave wireless connectivity)*
OFCOM	Communications regulator
PDA	Personal Digital Assistant *(a portable electronic personal organiser)*
QR code	Quick Response code *(a two-dimensional bar code, accessed via software using a mobile phone's camera)*
SMS	Short Message Service *(text messages)*
TNA	The National Archives

Glossary

App	*see* **Native app** or **Web app**
Crowdsourcing	tapping into the collective intelligence of the public at large to complete business-related tasks that a company would normally either perform itself or outsource to a third-party provider (Alsever, 2007).
Gamification	applying game design thinking to non-game applications to make them more fun and engaging, converting users into players (Gamification, 2012).
Hack day	a day where computer programmers get together to solve problems and think about creative ways of using data (Stephens, 2011, para. 1).
Mobile Web	the use of browser-based Internet services, from a handheld mobile device connected to a mobile network or other wireless network (Mobile web, 2012).
Native app	small pieces of software dedicated for a specific resource or function, built by third parties that individuals can download onto their smartphones (Murphy, 2010b, p. 17).
Open data	data that anyone is free to use, reuse, and redistribute, subject only, at most, to the requirement to attribute and/or share-alike (*Open definition*, 2009).
Smartphone	a mobile telephone with computer features that may enable it to interact with computerised systems, send e-mails, and access the web (smartphone, n.d.).
Tablet	a slim, internet-connected computer that is bigger than a smartphone but operates in a similar way with a touchscreen and downloadable apps. Tablets generally do not have a built-in keyboard. (Tablets: tablet buyers' guide, 2012).
Web app	web pages with specific functionality for mobile devices, accessed by the device's web browser (Mudge, 2012).

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NB: Harvard APA-style referencing (5th ed.) has been used throughout this study.

Chapter 1: Introduction

1.1 Research origins

The lack of any mention of mobile technology in literature from the Archives and Records Association (ARA), in contrast to similar professional societies for librarians and museum curators, was the starting point for the selection of this topic for research. Archives have connections with public libraries (through local studies), with academic libraries (through special collections), and with museums (through exhibitions and education):- so a cross-sectoral approach seemed appropriate for examination of the adoption of mobile technology.

1.2 Aims and objectives

The purpose of this dissertation is to determine whether, why and how mobile technology is being used by archive services.

The question to be researched is: How and why (or why not) are archive services embracing mobile technology, and how does this compare with the approach taken by libraries and museums?

The objectives of the research are to:

- identify the extent and nature of take-up of mobile technology by archives, libraries and museums;
- seek opinions from practitioners in archives, libraries and museums regarding the perceived and potential usefulness of mobile technology within the cultural heritage sector;
- determine why and how mobile solutions have been adopted for specific projects/problems;
- compare and contrast approaches within the different segments of the cultural heritage sector;
- recommend good practice for future mobile developments by archive repositories.

1.3 Definitions and scope

For the purposes of this study, mobile devices are considered to be handheld devices e.g. cell phones, smartphones, MP3 players, personal digital assistants (PDAs), tablets (e.g. Apple iPad) and audioguides. Laptop and netbook computers are not included as they are not handheld, and the user experience is more akin to that of a desktop computer than a phone.

This study will have a particular focus on the West Midlands administrative region.

1.4 Research value

This research will add value to the literature of libraries, museums and archives, as no comparative study has been undertaken so far and little quantitative data is available. It will fill a particular gap in the body of knowledge within the archive sector, as very little has been published on the topic.

This research is timely, owing to a rapid increase in mobile web users. Between 2009 and 2011, the number of mobile phone Internet users increased from 8.5 million (23% of Internet users) to 17.6 million (45% of Internet users) (Office for National Statistics, 2011a, para. 2).

1.5 Structure

A literature review follows this chapter, considering publications relating to the adoption and use of mobile technology within the cultural heritage sector, and relevant items concerning developments in mobile technology and the mobile Internet.

Chapter 3 explains the methodology, research design and research instruments chosen. A presentation of the results of the questionnaire analysis and the findings of the case study interviews is given in Chapter 4. This is followed in Chapter 5 by a discussion of the findings and, in Chapter

6, a conclusion reflecting on the findings in relation to the research question and the aims and objectives.

End matter includes: a comprehensive bibliography of works consulted, and appendices (including a list of journals searched; survey questionnaire; interview consent form; and case study questionnaires).

Chapter 2: Literature Review

2.1 Mobile Internet access

Increased portability and rapid take-up mean that telephones have become associated for the first time with an individual rather than with a household (Goggin, 2006, p. 2). 91% of adults in the UK use or own a mobile phone and 13% of adults live in a household with a mobile phone and no land line (Ofcom, 2012a).

Whilst web-enabled mobile phones were launched in 1996, it was not until the launch, in January 2007, of the first smartphone with an inclusive data bundle that it became an affordable reality (Bridges, Rempel & Griggs, 2010, p. 311). Between 2011 and 2012

> smartphone take-up rose from 27 per cent to 39 per cent of UK adults, representing 43 per cent of mobile phone users (Ofcom, 2012b, p. 222).

In the fourth quarter of 2010, 32% of adults in the UK reported using their mobile phone to access the Internet (Ofcom 2011a), almost double those questioned nine months earlier, when 18% of adults used their phone to access the Internet (Ofcom, 2010). This had risen to 34% by the fourth quarter of 2011 (Ofcom, 2012a). The Office for National Statistics (2011b, p. 1) reported that 45% of Internet users in 2011 accessed the Internet from a mobile phone whilst away from home or the office, compared to 23% in 2009.

In 2010, 3% of the total Internet traffic originated from non-PC devices, but by 2015 the non-PC share of Internet traffic is predicted to grow to 15% (Cisco, 2011). Anderson and Rainie (2012, p. 3) predict that smartphone traffic will increase 50-fold by 2016.

2.2 Mobile technology in cross-sectoral literature

The starting point for the choice of mobile technology and archives as a suitable topic for investigation was an apparent lack of consideration of the subject by the archive sector at a time - Autumn 2010 - when library and information journals seemed to feature many articles on the potential of mobile devices (e.g. Baker, 2010; Coombs, 2009; Farkas, 2010; Grange, 2010; Hadro, 2009; Jacobs, 2009; Jensen, 2010; Konshak, 2009; Luo & Bell, 2010; Mbambo-Thata, 2010; Mills, 2009; Murphy, 2010a; Nowlan, 2010; Vollmer, 2010).

The June 2010 issue of the electronic journal *Museum Practice* was dedicated to the use of mobile phone apps in museums (Stephens, 2010a-e). The mainstream press routinely featured museum apps and referred to the increase in mobile phone Internet use (e.g. Bingham, 2010; Cohen, 2010; Flintoff, 2010). In 2012, the Museum Association's survey of mobile engagement in museums found that only 12% of UK museums offered mobile phone apps to visitors, although the growth potential of the technology was noted (Atkinson, 2012a, para. 1).

Whilst museums have been holding conferences on mobile technology since 2008 (*Museum Mobile Wiki*, 2011) and CILIP hosted executive briefings on the topic in September 2010 (CILIP 2010; Nowlan, 2010) and in July 2012 (CILIP, 2012), the ARA has offered no such courses and published no articles on the subject in its newsletter or journal.

This lack of attention from archivists seemed curious when a combination of portability, ubiquitous connectivity and computing capacity has made mobile technologies a pervasive part of everyday life, "an extension of the human body as essential as the pencil behind the clerk's ear" (Ketelaar, 2008, p. 20). Perhaps it is that "archivists are not usually recognized for their ability or desire to implement changes quickly" (Goulet, 2010, p. 5).

2.3 Reasons for adoption of mobile technology

Callow and England (2011, p. 5) question whether organisations should adopt mobile technology because everyone else is doing it or because it offers real benefits for users. Atkinson (2012a, para. 6) agrees:

> rather than opting for an app because it's on-trend… museums should consider how visitors use their mobile phones in galleries and how technology can encompass and enhance an experience.

Adopting mobile technology must also have benefits for the organisation such as "premium revenues, content control and better user experiences" (Miller, 2010, p. 21). Tallon (2012, paras. 18-19) emphasised that a decision to adopt mobile technology should be strategic, not opportunistic:

> It should be based on the fact that mobile is the most appropriate platform to answer the needs or ambitions of the institution.

Ephraim (2011, p. 31), in advocating the use of mobile phones to replace library cards, opined that:

> too often, libraries and other institutions create policies with the comfort level of the staff as the main consideration, instead of taking the patron perspective into account… We should adapt to their world; after all, they are the reason for our existence.

If the customer is at the heart of cultural heritage organisations, then we should consider the use of mobile technology from the perspective and location of the user. As Rheingold noted in 2002 (p.xii):

> the 'killer apps' of tomorrow's mobile infocom industry won't be hardware devices or software programs but social practices.

However, the reasons for the adoption of mobile solutions and the impact of mobile initiatives on users seem not to have been much examined:

> Although there are numerous examples of the use of mobile devices for library resources, the literature does not contain any discussion of how librarians created these sites and services or why they felt the need to (Seeholzer & Salem, 2011, p. 10).

Walsh (2012, p. xv) agrees:

> much of the library-based literature focuses on the technologies… [not] why they were chosen to meet the users' needs.

Whilst output may be measured by user downloads, this has been described as a "vanity metric" which doesn't measure success (Gurwin, 2011, para. 2). An Arts Council report of 2010 states that it is the first report to capture and quantify online engagement with arts and culture, including via mobile devices. It concludes that engaging through digital media is a mainstream activity (MTM London, 2010, p. 4).

2.4 Mobile technology and the visitor experience

2.4.1 Reasons for visiting cultural heritage institutions

People generally visit museums for a combination of education, entertainment and relaxation, often linked to spending quality time with family and friends (Owen, Venn, Price & Featherstone, 2009, section 1.4). This, combined with the evolution from handheld audio guides, through multimedia PDAs to smartphones, affects the way that museums have used mobile technology to

> combine exhibition interpretation with up-to-date and contextualised information about events, services, and other activities in the museum. (Filippini-Fantoni & Bowen, 2008, p. 81).

In contrast, most visitors to libraries and archives are not seeking an entertaining day out but are searching for information, borrowing items or using computers (Public Services Quality Group of the Archives and Records Association (UK and Ireland), 2011, p. 22; Ipsos Mori, 2011, p. 18). However, Dresselhaus and Shrode (2012, p. 83) note the first use of handheld mobile access in libraries in 1993, where library patrons in the USA used PDAs to search and read electronic texts, and search the library catalogue whilst browsing the shelves.

Twenty years later, the new Library of Birmingham, which will also house the city's archive service and is due to open in 2013, will have mobile technology integrated into it from the design stage (Gambles, 2010).

2.4.2 "Edutainment"

For museums, mobile technology provides a convenient means for narratives to accompany visitors on the move (Samis, 2008, p. 7). The technology also enables the construction of structured visitor trails which visitors can adapt to assimilate new knowledge, personalising it to their own experience (Walker, 2007).

The adoption of mobile digital technology in museums is a natural progression of 50 years of analogue handheld technology, beginning with the Stedelijk Museum's *Short-Wave Ambulatory Lectures* in the 1950s (Tallon, 2008, pp. xiii). Broadcasts were delivered through a closed-circuit short-wave radio broadcasting system to visitors who had a receiver, causing groups to move through galleries in complete synchronicity, as if guided by an invisible force (Tallon, 2008, pp. xiii-xiv).

Since then, the audioguide has become an indispensable part of a museum's visitor offer (Proctor & Tellis, 2003, para. 3; Falk & Dierking, 2008, p. 19-20), although there has been a move from authoritative 'top-down' broadcasts by curators to the incorporation of oral history extracts, dramas, user discovery and collaboration (Bradburne, 2008, p. x; Butler, 2007). By 2004, approximately 35 million audio tours were distributed annually in cultural heritage organisations around the world (Tellis, 2004, para. 2). Surveys of handheld technology users in museums have found that visitors spend longer in galleries when using audioguides (Proctor & Tellis, 2003, para. 23; Manning & Sims, 2004, para. 24).

In 2004, it was noted that there had been a major transition in museums in the use of wireless handheld guides from mobile audio to mobile multimedia

(Tellis, 2004, para. 1). The Museum of Science in the United States noted the compelling power of PDAs for the "Enhanced Visit" (delivering additional content on demand via handheld devices) and the "Extended Visit" (broadening visitors' experience beyond the four walls of the gallery) (Hyde-Moyer, 2006, para. 2). The Blandford Museum of Art's *iTour* analysed the use of its multimedia PocketPC tours and concluded that mobile technologies offered opportunities for interactive learning, careful looking, critical thinking and enhanced dialogue with the museum and other visitors (Manning & Sims, 2004, para. 1).

Multimedia technologies in galleries allow curatorial input that does not disturb the gallery space (Angliss, 2006a) and deliver an interactive and personalised learning experience (Bradburne, 2008, p. x; Walker, 2007). There are concerns that the attention required for a multimedia device may result in an isolated visitor experience (Gammon & Burch, 2008, p. 48), and it has been suggested that audio tours may remain a preferred device as they continue to direct visitors' attention to the exhibits and not to the device (Tellis, 2004, para. 3). However, if properly thought-out, the use of technology can deliver a truly social and collaborative experience, allowing a constructivist approach in which people learn best by generating knowledge and meaning through interaction (Atkinson, 2011a, para. 12; Gammon & Burch, 2008, p. 48).

The University College of London's Grant Museum of Zoology takes collaboration further by allowing visitors' thoughts and comments to be inputted via iPads, Twitter or its *Tales of Things* app so that they actually become part of an object's history (Ross, 2011).

2.4.3 Gamification

The popularity of games consoles and online gaming has encouraged the gamification of educational projects aimed at children, especially through multi-user social experiences (Raessens, 2007; Stephens, 2010f). The 2005

IADIS International Conference on Mobile Learning featured a team-based museum scavenger hunt project using Augmented Reality (AR) on PocketPC PDAs to deliver 3D visualisations superimposed on real exhibits and using a multi-user communication system to allow visitor interaction, particularly through location-based games (Schmalsteig & Wagner, 2005). AR has also been used by the British Museum as a discovery-based learning tool in its *Journey to the Afterlife* exhibition. Participants used Android phones to follow trails and collect clues, which they then turned into their own personal *Book of the Dead* (Atkinson, 2011b).

ARCHIE was a collaborative project between Hasselt University and the Gallo-Roman Museum, Belgium involving the creation of a PDA trading game. Using handheld devices to strengthen the experience of a group visit and promote unconscious learning, the game was specifically designed so that every player was dependent on the actions of other players and "only through social interaction and cooperation can they come to a good result" (Van Loon, Gabriels, Luyten, Teunkens, Robert, Coninx & Manshoven, 2007, para. 2).

2.4.4 Roaming reference

As many library interactions involve staff finding information for enquirers, often away from an enquiry desk, staff at the Florence County Library provide a roaming *iReference* service through the use of iPod Touch mobile devices (Hamby & Stubbs, 2010). A similar experiment was carried out at the University of Warwick using a Nokia smartphone, with mixed results, although the addition of a newly-launched Apple iPad transformed the staff and user experience and has been introduced into the mainstream service (Widdows, 2011).

Staff at the University of Maryland Baltimore County also used iPads to deliver roving reference services in high-traffic non-library areas of the campus (Gadsby & Qian, 2012). Wireless tablet devices have also been used

successfully for roaming reference services in a public library setting (Cheetham & Gray, 2007).

2.4.5 Provision of mobile devices

Tallon and Walker (2008, p. 87) note the technical difficulties of delivering multimedia tours by means of hardware with which visitors are unfamiliar, necessitating trained staff to show people how to use the devices, which tends to impede the flow of visitors. The use of visitors' own mobile devices reduces this, as people are often very familiar with their own devices so less staff input is required, and hardware maintenance costs for the museum are reduced (Filippini-Fantoni & Bowen, 2008, pp. 91-92). Offering advance downloading of apps also enables visitors to plan their visit beforehand (Falk & Dierking, 2008, p. 25).

2.5 Mobile technology and potential visitors

2.5.1 Visitor information

It appears that libraries using mobile technology focus mostly on providing visitor information such as location, opening hours and availability of resources (e.g. PC availability, library catalogue) (Thomas, 2012b). Effectively, this is merely an extension of the promotional leaflet, guiding people to the physical building for services, rather than providing services online (King, 2009, p. 6). In 2011, 77 per cent of visitors to archives reported using the archive service's website (Public Services Quality Group of the Archives and Records Association (UK and Ireland), 2011, p. 21), although there is no indication whether or not access was from a mobile device.

There have been references in library journals to mobile technology in the UK since 2002, albeit almost solely as a means of engaging with young people, who were perceived as the primary users of the technology (Nicholas & Chivhanga, 2002). A few academic libraries had also experimented with

the early adoption of 'small-screen devices' (Williams, 2003; West, Hafner & Faust, 2006).

2.5.2 Optimising websites for mobile devices

An indication of the pace of technological change may be seen by examining the Society of Archivists' guidelines for archival websites (Shenton, 2002). The author makes no mention of designing websites to be accessible from mobile devices; it was tacitly understood in 2002 that users would be viewing websites from desktop or laptop computers.

Given the increase in the use of mobile devices to access the Internet outlined in section 2.1, having a website optimised for a range of mobile devices should be an essential requirement for organisations wanting to engage with people in an age of ubiquitous connectivity (Jensen, 2010; Hanson, 2011a, p. 26-28).

Web sites that are optimised or adapted specifically for mobile access are device agnostic and do not require advanced knowledge of smartphone operating systems (Dresselhaus & Shrode, 2012, p. 93) so should not be difficult or expensive to implement (Sach, 2012).

2.5.3 Being part of a parent organisation's app

In 2009, 65% of US academic libraries said they either offered or planned to offer mobile services (Kosturski & Skornia, 2011, p. 11). Ryerson University in Toronto, Canada surveyed users as to their current and future mobile phone hardware and usage and this survey informed the creation of a campus-wide mobile app, forging partnerships between the library and other university departments (Wilson & McCarthy, 2010).

2.5.4 Finding aids

The archivist's role is traditionally that of neutral and passive custodian (Lane & Hill, 2011, p. 4). This approach has transferred to archive websites where, rather than offering interpretation, the emphasis has generally been to provide access to digitised finding aids so that users are better informed when visiting a repository (Shenton, 2002, p.7).

Archives for the 21st century (Great Britain. Command Papers, 2009) committed to offering access to catalogues and digitised content at a place and time to suit customers, thus implying, if not explicitly mentioning, via mobile devices. The Action Plan drawn up in 2002 in response to the *Government Policy on Archives* (Great Britain. Command papers, 1999) refers to the Government's commitment to Internet access, including from mobile phones (Great Britain. United Kingdom Inter-Departmental Archives Committee, 2002, A1.5.4).

There are similarities between archives and libraries in digitisation efforts targeted towards cataloguing, although the early 1980s to mid-1990s has been described as the golden age of the online catalogue (Markey, 2007, para. 7). Hill (2011, p. 238) noted the erosion of traditional differences across domains as organisation participate in collaborative projects, such as the Archives Hub. However, library users feel library catalogues are too complicated compared with Google (De Rosa, Cantrell, Cellentani, Hawk, Jenkins & Wilson, 2005) and there is a general sense, even amongst some archive users, that "Google will answer everything" (Goulet, 2010, p. 9).

Goulet (2010, p. 8) also notes a new category of users who expect instant answers from archivists and approach archive websites "in the same manner as they consume information every day".

An investigation by Heimonen (2009) into mobile information needs discovered that experienced mobile Internet users make use of search and mobile web to satisfy information needs when they emerge. Seeholzer and

Salem (2011, pp. 19-20) expressed surprise at discovering that university students wanted to be able to conduct research and interact with library resources from their mobile devices:

> Our assumption was that basic library information would suffice on a mobile Web site; however… when planning a mobile Web version of their site, academic librarians may wish to gather data regarding user expectations... It may be necessary to offer more than contact information and hours on the mobile Web.

Rushby (2012, p. 355) notes a difference between elective and enforced mobile use and

> given that the users have already chosen to use mobile devices for their networking, it is hardly surprising that they prefer this approach to learning too.

It is surprising that the suppliers of archival cataloguing programs do not appear to be devoting significant effort into developing mobile apps, especially as some of these suppliers have developed mobile apps for their library-based systems (Axiell Library Group, 2010). Perhaps this is related to a lack of demand from repositories, the complexity of archive catalogues, and the presumed scholarly research activities of most users of original documents, given that

> it is unlikely that mobile devices will become the platform of choice for a large number of scholarly research activities… [although] there are many services that can be adapted or created to take advantage of devices that are always on, have a small screen and a challenging input device, and are increasingly location aware (Wilson & McCarthy, 2010, pp. 214-215).

The National Archives (TNA) plans to release a mobile app of its online catalogue, *Discovery*, in 2013 (National Archives, 2012b), which may encourage other repositories to make their catalogues mobile-friendly.

Archive services seem to be focusing on Web 2.0 as a way of engaging with virtual users (e.g. Crymble, 2010; Dwiggins, 2010; Goulet, 2010; Samouelian, 2009). It has been noted that archivists appear to be happy to

embrace user collaboration, provided that the archival voice is retained intact (Ketelaar, 2008).

2.6 Mobile technology and virtual users

There is no doubt of the interest by the public in heritage resources and historical information online (*An Chomhairle Leabharlanna*, 2003). In 1994, the first UK museum website was launched and, within 8 years, the museum's virtual visitors were more than double its physical visitors (Hawkey, 2004). In 2009/2010, 53% of the online population engaged with the arts and culture through digital media, and 6% downloaded software or mobile apps related to the arts (MTM London, 2010, p. 4).

However, Corr (2011) suggests that fiscal austerity in public services may mean greater access to fewer resources, as non-digitised material is already invisible to many and will be even more difficult to access in person as services cut opening hours.

Much of the effort in libraries is directed at giving customers an additional access point for transactions such as renewals and reservations (Gambles, 2010), although academic libraries have been using mobile technology for e-learning since at least 2003 (Deneen & Allert, 2003).

2.6.1 Transactions and communication

A noticeable trend in mobile library apps is the emergence of library management system vendors and resource suppliers as developers of mobile apps that are location-aware (Kosturski & Skornia, 2011, p. 12; Axiell Library Group, 2010; Murray, 2010, p. 245).

Some libraries have also taken advantage of the Short Message Service (SMS) to send text messages to customers. This has mostly been related to transactional messages (e.g. reservation notifications, overdue reminders) (Konshak, 2009). However, others are using SMS reference services to

answer enquiries. A collaborative SMS system, *My Info Quest*, launched in Illinois in 2009, involved 64 partners, including academic libraries, public libraries, individuals, regional library organisations and school libraries (Luo & Bell, 2010, p. 275). Library participants in Illinois reported early optimism and enthusiasm about the *My Info Quest* service and noted a monthly growth rate of 23% in queries received during the first four months (Luo & Bell, 2010, p. 281).

Huddersfield University's *Text a Librarian* service was introduced to provide a convenient means for students and staff to communicate with the library and to obtain a quick answer (Walsh & Barrett, 2009). However, the service seems to have had a lukewarm response and students struggled to think of questions to ask (Walsh, 2012, p. 12).

Academic libraries have often been at the forefront of developing mobile services for customers, largely because of the demographics of their users who have a documented preference for digital information access, even deliberately using less relevant information obtained electronically in order to avoid visiting a library (Connaway & Radford, 2007, p. 2).

Academic libraries have also been early adopters of QR (Quick Response) codes for user education, linking to related resources and contact information (Farkas, 2010; Walsh, 2010d). However, although an interesting experiment for organisations, the technology seems slow to be adopted by students (Ramsden & Jordan, 2009). Student focus groups at Huddersfield University felt QR codes were not worth any investment of time by the library (Walsh, 2012, p. 15).

2.6.2 Collection development

The only explicit reference to mobile technology and archive services discovered in the professional archive press is mention of the acquisition by the Library of Congress of *The September 11 Digital Archive*, including data

from mobile phones, and the extraordinarily powerful documentary evidence such data can provide (Caswell, 2009).

Active collection development using mobile crowdsourcing is an area of activity for specialist repositories. For example, the British Library has created the *UK SoundMap*, encouraging smartphone users to record their surroundings and upload the resulting geo-tagged MP3 files to an interactive map (Capturing the sounds of the UK, 2010).

2.6.3 Location-based information

Despite the assertion of Goggin (2006, p. 195) that the 1990s were dominated by theories that cyberspace abolished the concept of place, José and Davies (1999, p. 52) reported on

> considerable interest in supporting methods of information access in which applications dynamically select the information that is relevant to their current location.

Technological developments have now made this a reality and there is potential for cultural heritage organisations in meeting demand for "location-based interpretation of local communities, landscapes and cities" (Butler, 2007, para. 8). The goal is to understand what a user is doing in a place and enmesh service offerings into that context (Goggin, 2006, p.197).

Extending the visit outside the gallery, based on the user's location, was the aim of Manchester Art Gallery. Staff used QR codes in public spaces in the city to deliver location-based interpretive content to people as they came across public art in the city (Grimes, 2011).

An exception to the slow adoption of QR codes noted in 2.6.1 above is a US college student who put temporary QR tags on his college's historic buildings and linked them to a history website he created after carrying out research in the college's archives (Biemiller, 2011).

Dwiggins (2010, paras. 1-2) describes the role of archive services in supporting collective memory and enhancing sense of place through the "deep, intrinsic connections between places and historical record". The fact that

> It's not just that 'something happened'; it's that 'something happened here' - in this particular location" (Dwiggins, 2010, para. 1)

is crucial in connecting archives to communities and helping people to make meaning out of their environment.

Location awareness is a feature of the *Hidden Newcastle* app, where stories and photographs are linked to places and users can unlock more stories as they move around the city (Henderson, 2012).

The *Manchester Time Machine*, is

> the first ever app for the iPhone which merges archive film with GPS to create a street level tour of Manchester's streets and people over the last 100 years (Manchester Metropolitan University, 2012, para. 1).

The app, instigated by the North West Film Archive, had 5000 downloads in the first two weeks and is regarded as a new form of narrative/GPS cinema (Hawley, 2012).

2.7 Conclusion

The development of the Internet has led to increasing disintermediation in information searching, with end-users increasingly connected directly to content (Nicholas & Rowlands, 2008). Where information professionals were previously the gatekeepers of information, for the majority of information seekers the gatekeeper is now Google (Markey, 2007).

Information organisations find themselves in a context of user expectations of convenient, immediate results where "information which is not available electronically is worthless" (Craig, 1998, p. 119). This is particularly challenging for archive services where the vast majority of resources are not

available electronically and those that have been digitised are mostly geared to family historians (Corr, 2011, para. 2).

Multimedia tour guides were a revolution in museums ten years ago (Filippini-Fantoni & Bowen, 2008, p. 79). Libraries and archives still have to experience their mobile technology revolutions but libraries are beginning to be affected (Murphy, 2010b, p.16). However, Hahn (2009, p. 273) concludes that mobile access need not be a solitary stand-alone service but is just one service element in a range of access points.

The challenge for customer-facing institutions is how to design or adapt services to offer converged content, and take advantage of the technological possibilities to engage with the 'Information Now Generation'. These people are permanently connected to the Internet and expect to be able to find the information they need instantly wherever they may be (Jacobs, 2009, p. 288).

To ignore mobile access to services, even in an age of austerity, seems reckless when "the future of mobile is the future of computing" (Hanson, 2011a, p. 34) and a mobile phone is:

> for many people the only other thing they always have with them, other than their wallet or purse, keys or watch (Goggin, 2006, p.146).

Chapter 3: Methodology

3.1 Introduction

This chapter explains the details and rationale of literature searching, research instrument design and data collection.

In attempting to answer the research question of how and why archive services are (or are not) embracing mobile technology, and comparing this with the approach taken by libraries and museums, a largely inductive research method has been adopted. It is hoped that the outcome of this research will feed back into the body of knowledge (Bryman, 2008, p. 11).

3.2 Literature search methodology

3.2.1 Search strategy

In order to gain an overview of existing knowledge, searches were carried out in WorldCat and the online library catalogues of Aberystwyth University, the British Library and Birmingham Public Libraries, using search vocabulary indicated in section 3.2.2.

As mobile technology in the cultural heritage sector is still an emerging topic, published academic research is relatively small. Results from searching library catalogues for monographs were limited. Most works identified related to technical aspects or the social impact of the technology.

Citation indexes in the Arts, Sciences and Social Sciences were searched via *ISI Web of Knowledge*. Also, online databases of *Library and Information Science Abstracts (LISA)* and *Library, Information Science and Technology Abstracts (LISTA)* were searched. A *ProQuest Library Science* alert was set up in June 2011 for the key words of "mobile technology" across 190 information journal titles (*Proquest Library Science*, 2012).

Potential key journals in the fields of archives, libraries and museums were identified (see *Appendix 1*) and all issues for each title from 2007 to May 2011 were physically browsed. A *British Library Zetoc* alert was then set up in June 2011 so that notifications of journal contents were automatically received when new issues of any of these key titles were published.

Searches were also carried out in Google and Google Scholar in order to identify any relevant items, especially press releases and news items about the introduction of new mobile apps, which might not have generated academic or professional articles. A Google e-alert was also set up for the key words "mobile technology AND ("record office" OR library OR libraries OR museum)".

E-mail discussion list archives were searched and subsequently monitored: LIS-LINK (library research); LIS-PUB-LIBS (public libraries); ARCHIVES-NRA (archives); and GEM (museum educators).

3.2.2 Search vocabulary

Some difficulties were encountered in establishing search terms that would bring consistently relevant literature results.

The widespread use of the terms "library/libraries" and "archive(s)" in the computing field resulted in irrelevant items relating to programming assets and backup storage. Substituting the term "record office(s)" for "archive(s)" gave more relevant results. "Special collection(s)", "academic library/libraries" and "public library/libraries" were also used to refine results. No ambiguity was found using "museum(s)" as a search term.

Combining "mobile" and "library/libraries" returned results relating to vehicular delivery of library services. Combining the terms "mobile phone(s)" and "record office(s)" also frequently gave results referring to searchroom regulations.

Whilst in the UK “mobile phone” is common terminology, American usage is “cell phone” so this had to be taken into account when searching international publications. As mobile devices increasingly also include tablet computers and non-phone devices such as the iPod Touch, “mobile technology” and “mobile computing” were included as more effective search terms than “mobile phone(s)”. “Handheld” was also used as a search term to ensure discovery of devices that were not phones or tablets.

3.2.3 Scope of literature review

When searching databases, or browsing physical issues of journals, the date selected from which to begin was January 2007, the date of the launch of the first smartphone (Apple iPhone) and a key milestone in the development of mobile services.

3.3 Research data required

To answer the research question, it was necessary to measure the extent of cultural heritage organisations’ engagement with mobile technology and to be able to compare results across the sector.

The collection and analysis of empirical data was needed to determine whether the impression of activity gained from the literature review was borne out by practice.

An investigation of practitioners’ attitudes towards the perceived benefits and disadvantages of the technology was also required to indicate reasons for the introduction (or not) of mobile services, and to discover how far such services were opportunistic or part of a strategic framework with clear aims and objectives. The literature review also led to questioning how far any mobile projects were collaborations with partners or part of a parent organisation’s move to introduce mobile services.

In a climate of fiscal reductions, it also seemed appropriate to ascertain how far any future plans for mobile services were likely to be linked with external funding bids, or whether austerity measures meant mobile service developments were perceived to be of little importance.

It seemed, therefore, that in order to measure descriptive data and obtain indicators of opinions and meaning, a mixed research strategy using qualitative data to illuminate quantitative findings was required. This allows the presentation of information in both narrative and numerical forms (Teddie & Tashakorri, 2009, p. 8). Although mixed research strategies have been criticised as diluting the "purity and legitimacy of the traditional methodologies" (Teddie & Tashakorri, 2009, p. 316), Blaikie (2009, p. 227) states his view that mixed strategies should be considered normal and usually necessary, whilst Sutton and David (2004, p. 45) despair of the energy expended by both sides of the divide and they maintain "all research has a qualitative dimension… and a quantitative dimension".

3.4 Sampling frame

The West Midlands administrative area was selected as a convenience sample to study. Although it is not certain whether the region is representative of the rest of the UK, it is geographically compact, has both large urban conurbations and predominantly rural counties, and includes a broad range of relevant organisations:

- a mixture of county, metropolitan and unitary authorities
- county and city record offices
- company or other specialist archives
- local authority museums and art galleries
- independent and community museums
- public library authorities
- academic libraries with special collections

Consideration was given to requesting survey responses from all heritage practitioners within the region. However, this approach was rejected as it

could have resulted in a disproportionate response from organisations with more employees, which could have given an unrepresentative picture of the extent of mobile projects.

A random or systematic sample taken from a sampling frame of all West Midlands-based members of professional bodies was also considered. However, this could also have resulted in an unrepresentative response from employees of larger cultural heritage institutions, as above. There would also have been significant, and probably insurmountable, practical difficulties in obtaining the necessary sampling frame data from which to take a random or systematic sample. Data Protection considerations would, of course, restrict access to membership lists and such a sample would require a considerable administrative input from the professional bodies concerned, which was extremely unlikely to be a practical proposition for the purposes of this study.

Mobile solutions may be a significant commitment and expense for institutions, so implementation is likely to take place only after a strategic decision to proceed, supported by sufficient funding. This is in contrast with other no/low-cost technology-based service developments such as social media, where experimentation and implementation may take place based on existing staff skills and enthusiasm, without such strategic decision-making and without the need to commit precious financial resources. Therefore, an approach targeting organisational, rather than individual, use of mobile technology seemed most appropriate.

In order to achieve a research population of "as many as necessary and as few as possible" (Crombie & Davies, 1996, p. 199) it was decided to target one individual in each cultural heritage organisation within the West Midlands region. Wherever possible, this was a named decision-maker, such as a senior manager or head of service.

Relevant archive repositories and institutions with special collections were identified through the *Archon directory* (National Archives, 2012a). Museums were identified through *Archon* and local authority websites, as well as through the Museums Association's online directory (Museums Association, 2012). Public libraries were identified through local authority websites, and academic libraries were identified via the Universities West Midlands website (Universities West Midlands, 2012).

The survey ran for two months (29 April-30 June 2012) and included a question asking if respondents would be willing to participate in further interviews. No incentive was offered, nor was there any obligation to complete the questionnaire, or to participate in interviews.

In addition, as the literature review had revealed that library management system suppliers were often actively developing apps for their systems, it seemed advisable to establish if this approach was also being taken by suppliers of archive and museum collection management software. Two software developers were identified based on an existing identifiable cultural heritage customer-base in the West Midlands and approached for interview.

3.5 Methods of data collection

Of the three broad research methods available - observation, surveys and interviews - this study utilises a survey and interviews.

Observation was rejected as not being appropriate for this study because of the need to obtain facts and opinions rather than to study behaviour. A focus group was considered, which could have assisted in discussion and a possible joint consensus on trends and activities, but it would have been impractical, expensive and time-consuming to bring geographically dispersed, busy practitioners from across the sector to a suitable location.

Therefore, a self-administered electronic questionnaire was chosen as the most appropriate method for obtaining quantitative and some qualitative

data (through the use of open-ended questions) with minimum time commitments from participants. Having an online survey would be quick and convenient for the respondent, allow considered responses from a dispersed target audience, and be straightforward to analyse.

In addition to the largely quantitative data discovered through the survey, in-depth qualitative interviews based on a smaller data set would draw out wider content for analysis. The use of a survey would also enable identification of organisations involved in activity that could inform the body of evidence and make an informative case study. With the predominantly inductive stance of the research, it was hoped that such case studies would aid in drawing inferences that could be generalised.

The survey and interviews sought to find out participants' experience and feelings and thus depended upon a positivist research model (Silverman, 2010, p. 190).

3.6 Research ethics

During the collection of data for this study, the researcher has followed Aberystwyth University's Good Research Practice (Aberystwyth University, 2012) and the Department of Information Studies Ethics Policy for Research (Urquhart & Rogers, 2004).

Data Protection legislation has also been followed and questionnaire responses and interview transcripts were password-protected and backup copies stored on encrypted removable media.

No vulnerable groups were contacted or involved in this study.

3.7 Questionnaire methodology

Following a traditional 'funnel' approach to questionnaire design (Barnes, 2001, p. 2), the survey began with simple scene-setting questions, followed

by factual questions on activity and opinions. The final section requested details of the respondents, including age and number of years of experience within the sector.

In order to aid data collection and analysis, questions were structured to give closed category responses, although open questions were included, where appropriate, to enable respondents to add comments or further explanations (see *Appendix 2*).

Survey respondents were presented with a series of ethics statements at the beginning of the online survey (see *Appendix 2*), and continuing with the survey depended upon acceptance of these statements.

3.7.1 Question phrasing

Given the technological topic of the study, extra care was taken in the phrasing of the questions to minimise any confusion by the use of technical jargon with which respondents might be unfamiliar. Sometimes, technical words were used without explanation (e.g. API keys, linked open data, web apps) as it was considered that organisations involved in activities in these areas would understand the terms.

Where a question was asked about future plans, a time frame was added to the question as a qualifier.

Wording was kept detached and posed from an objective viewpoint. Sections were added for both advantages and disadvantages of mobile technology, to avoid bias by soliciting only either positive or negative responses. The wording of the questions was positive as:

> negatives in the wording do impact the process of interpreting the questions, leading at least some respondents to misinterpret how to respond (Johnson, 2004, p. 85).

3.7.2 Response formats

Of the 13 topic-based questions asked, 7 were single-response checklists, five were Likert-type interval response scales and one was a drop-down categorical selection. The latter was a control element relating to geographical location so that any non-West Midlands responses could be excluded from further analysis.

In order to ensure that respondents were able to select 'other' as a more appropriate option than those offered as checklist options, 6 of the checklist questions offered an open-ended comments box. This enabled qualitative comments from respondents.

3.7.3 Data collection methods

The survey questionnaire link was distributed via e-mail. All of the organisations identified in section 3.4 of this study were sent an e-mail link to the survey questionnaire and invited to participate.

Where it was possible to identify a named individual as Head of Service, the e-mail was sent directly to that person in an effort to improve response rates through personalisation. Where this was not possible, online contact forms or generic e-mail addresses were used instead.

3.7.4 Data analysis

The survey questionnaire data was collected via an online survey website, so that data was automatically logged on completion, without requiring any manual input by the researcher.

The data was prepared for analysis by ensuring that the responses received were all valid in terms of the geographic limits of the study, so any responses from outside the West Midlands were not included in the analysis.

The survey data was exported from the online survey as a .csv file for manipulation in Microsoft Excel to create descriptive statistics and charts for presentation in Chapter 4 of this study.

3.8 Interview methodology

3.8.1 Research population for interviews

From the questionnaire responses, a judgement sample was selected as being "the most productive sample to answer the research question" (Marshall, 1996, p. 522). Potential interviewees were selected based on:

1. sector of work (balanced between museums, libraries and archives);
2. evidence of activity with mobile apps/web apps;
3. degree of innovation in mobile activity.

In addition, two software developers were invited to participate in interviews. Both had a significant archive client-base in the West Midlands and each developer was believed to be taking a different approach to planning mobile solutions. Although both developers expressed an initial willingness to participate, neither responded to subsequent contact, so no developer interviews took place.

3.8.2 Question design

The broad themes for the case study questions emerged during the literature review, enhanced by the survey questionnaire. As "asking good questions is key to getting meaningful data" (Merriam, 2009, p. 114), separate questionnaires with appropriate rationales were designed for cultural heritage institutions (*Appendix 4*) and for developers (*Appendix 5*).

Fact-based questions were placed at the beginning of the interview so that the respondent could become involved in the interview as soon as possible (McNamara, 2009, para. 6).

Opinions from cultural heritage professionals engaged in mobile projects were sought on: how far any involvement with mobile technology was a natural extension of existing services or a paradigm shift in culture; whether it was staff- or user- or developer-driven; what impact mobile services have had, or were likely to have, on staff training and recruitment; how content would be updated and what plans were in place for sustainability/future developments; what user feedback has been received; and what lessons have been learned from projects that have been undertaken.

Questions were open-ended, neutral, asked one at a time, clearly worded and largely avoiding "why" questions (McNamara, 2009, para. 7).

3.8.3 Data collection methods

Potential interviewees were sent an information sheet and consent form (see *Appendix 3*) in order to ensure they could give informed consent for their participation.

The researcher followed McNamara's 8 tips for interview preparation (2009, para. 3) and interview questions were submitted to potential interviewees in advance. This enabled informants to prepare considered responses, where necessary, and ensure they could be relaxed about the nature of questions to be asked.

A known problem with semi-structured interviews is the potential for lack of consistency by the researcher in posing questions, which may lead to differences in answers by informants (Turner, 2010, p. 755). However, by submitting the same questions to all interviewees in advance, the impact of any rephrasing of planned questions in the interview was reduced.

3.8.4 Data analysis

The interview data was collected via two personal interviews and one telephone interview. Interviews were audio-recorded with interviewees' permission, in order to ensure accuracy and avoid interview bias (Bailey, 1994, p. 175). The recordings were then transcribed to aid analysis. Each interviewee was sent a transcript of their interview to ensure transparency and so that they had the opportunity to correct any inaccuracies.

The transcripts have been coded using meaningful statements (Carey, 2009, p. 157) related to the research objectives. See *Appendix 6* for an example of this coding.

3.9 Review of methodology

3.9.1 Survey questionnaire methodology

A comparatively low response rate of 45% from academic libraries, 48% from local authority museums and 47% from other museums, means activity in these sectors is underrepresented in the overall results. Responses from archive services and public libraries were significantly above 50% (see *Table 1*), which enables more confidence in the validity of these responses as being representative of the target research population.

Poor response rates are a known disadvantage of online surveys and Baruch and Holtom (2008, p. 1150) noted different response rates to surveys when targeted at top executives representing the organisation (average response rate: 35.7%) rather than general employees (average response rate: 52.7%). However, given the desired outcome for this study of single organisational responses, wider circulation of the questionnaire (e.g. to all members of CILIP West Midlands branch) would have compromised the research strategy.

Although senior managers in organisations were targeted, it is possible that these staff have less familiarity with mobile technology and passed on the

survey link to less senior staff who may have more experience of the technology but be less aware of an organisation's overall strategy. To some extent, the inclusion of a question of the number of years' experience of the sector assisted in determining how widespread this approach was in practice.

Circulating the survey link by e-mail had the potential of the link being forwarded to multiple respondents within an organisation, or to people outside the target research population. This appears not to have been an issue, with only two organisations submitting more than one response (relating to different sectors of activity), and only one response being received from outside the West Midlands region.

3.9.2 Interview methodology

Problems may be encountered with potential interviewees, as individuals have to be willing and able to be interviewed. There may be organisational restrictions on external interviews, and participants may have a vested interest in playing down negative experiences. With software developers in particular, there may also be issues surrounding commercial confidentiality of current or future developments.

Depending upon a positivist model of research may "de-emphasize the multiple meanings that people attach to what they do" (Silverman, 2010, p. 191). Such potential over-simplification may also be compounded by an interviewee's desire to please the interviewer or to base responses on their current preoccupation:

> all information obtained from an informant has been selected, either consciously or unconsciously, from all that he or she knows. What you get in an interview is simply the informant's perception of the phenomenon of interest at that particular point in time. (Merriam, 2009, p. 114).

A further difficulty of a geographically-limited research population where activity levels are low, is that case study participants may be more easily identifiable. Care has been taken to remove any identifying comments.

3.9.3 Reliability and validity

A limitation of using non-probability samples is that results may not be reliable as regards generalising to other locations and sample frames, although studies are still potentially useful in acting as a springboard to future research (Bryman, 2008, p.183).

Whilst not having external reliability, the research has internal reliability in terms of consistency of questioning (Sutton & David, 2004, p. 369). It would be able to be reproduced in the future, based on the transparency of the methodology, availability of the survey and interview questions (see *Appendices 2; 4-5*) and the details of the sampling frame.

An overall survey response rate of 60% has validity, given that it represents almost two-thirds of the research population. Barnes (2001, p. 1) indicates that a return rate of 30-35% is considered good for an unsolicited questionnaire. The response rate gives a confidence interval of 8.73 at a confidence level of 95% and a standard deviation of 20.84% across museums, libraries and archives from a mean response of 62.83%.

Chapter 4: Results

4.1 Introduction

This chapter presents the results of the survey questionnaire and the case study interviews. The overall response rate is given, followed by descriptive data from questionnaire responses and interview discussions.

4.2 Survey response rate

Individuals from 85 museums, libraries and archives were invited to participate in a self-administered online survey. 53 responses were received from 51 cultural heritage services (see *Table 1*), giving an overall organisational response rate of 60%. Two cross-sectoral organisations submitted two responses, each reflecting the individual respondent's service (e.g. archives or museums).

Sector	No. of organisations targeted	No. of organisations responded	Response rate from organisations
Local authority archive	12	12	100%
Other archive	9	7	78%
Public library	14	9	64%
Academic library	11	5	45%
Local authority museum	25	12	48%
Other museum	15	7	47%

***Table 1**. Survey questionnaire response rate by service targeted.*

4.3 Questionnaire responses

4.3.1 Question 1: Place of work

The 53 respondents to the online survey were fairly evenly spread between sectors, with five respondents categorising themselves as 'other' and indicating they held a cross-sectoral portfolio of responsibilities (*see Fig. 1*).

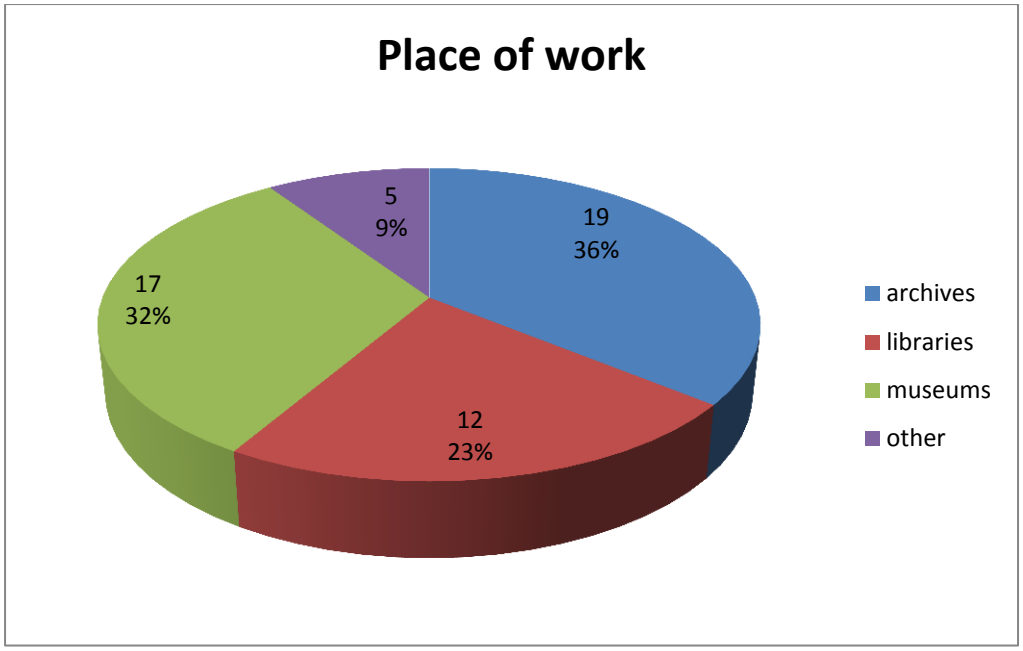


Fig. 1.

Number and percentage of individual respondents from each sector.

4.3.2 Question 2: In which county/region is your workplace?

This was a control question to ensure that only responses from individuals working in the target area of the West Midlands region were analysed. Only one response was received from outside the region, and this was not considered in the analysis.

4.3.3 Question 3: Do you access the Internet from a mobile phone or tablet?

There seems to be a significant cross-sectoral difference in respondents' personal mobile Internet access. Library staff are more likely to have daily access and museums staff are least likely to access the Internet from a mobile device (see *Fig. 2*). It is noticeable that most respondents seem to access the mobile web either every day or never.

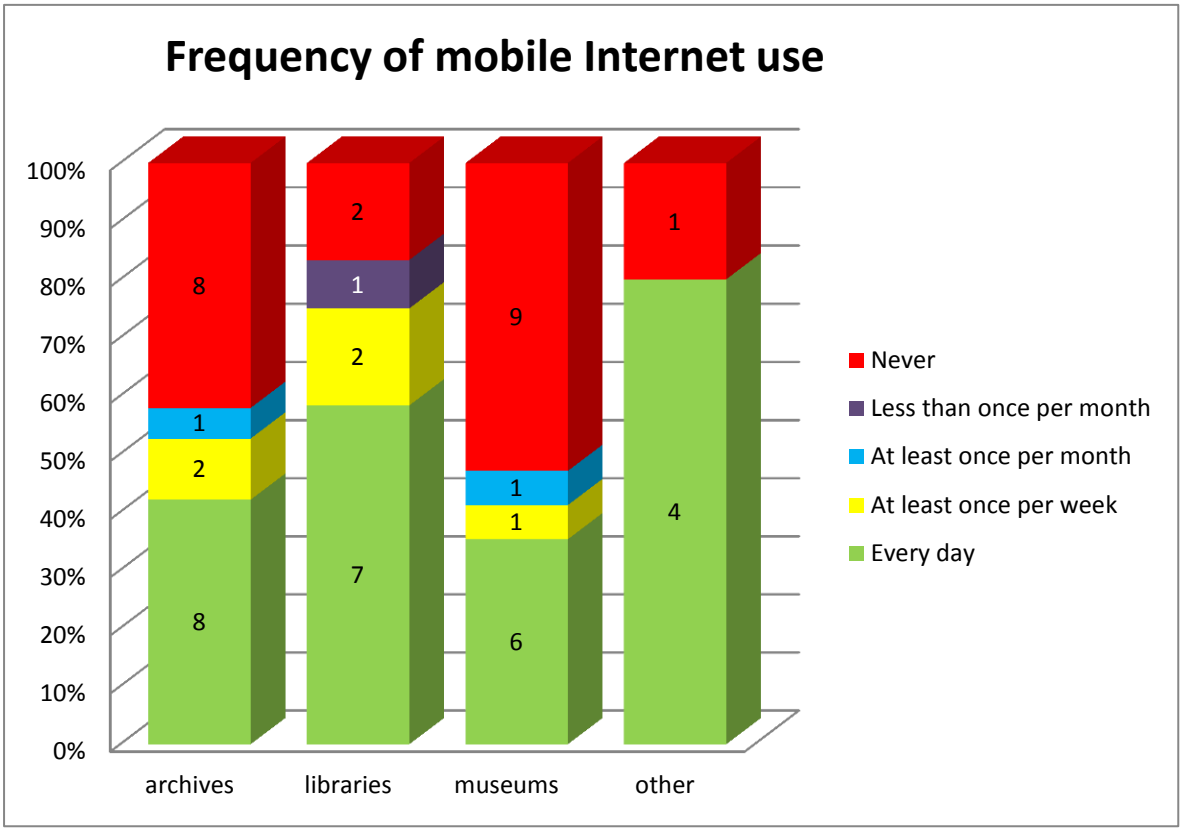


Fig. 2: *Frequency of respondents' mobile Internet use*

4.3.4 Question 4: Do you own/use a smart phone or tablet?

Library staff seem to lead the cultural heritage sector in the use of mobile devices, with only 25% (3/12) of library respondents not having a smartphone or tablet, compared to 53% of museums (9/17) and archives (10/19) respondents respectively (see *Fig. 3*). The 60% of 'other' respondents having Blackberry devices may reflect the popularity of these devices for issue to senior managers.

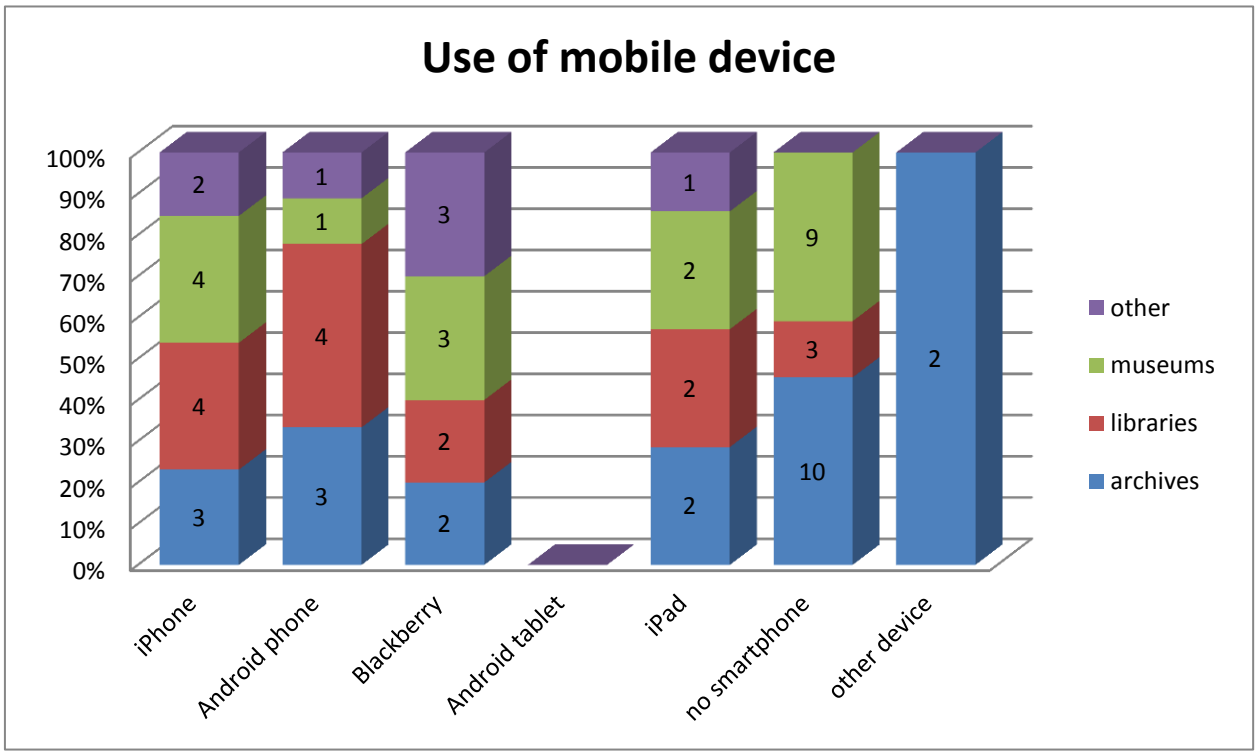


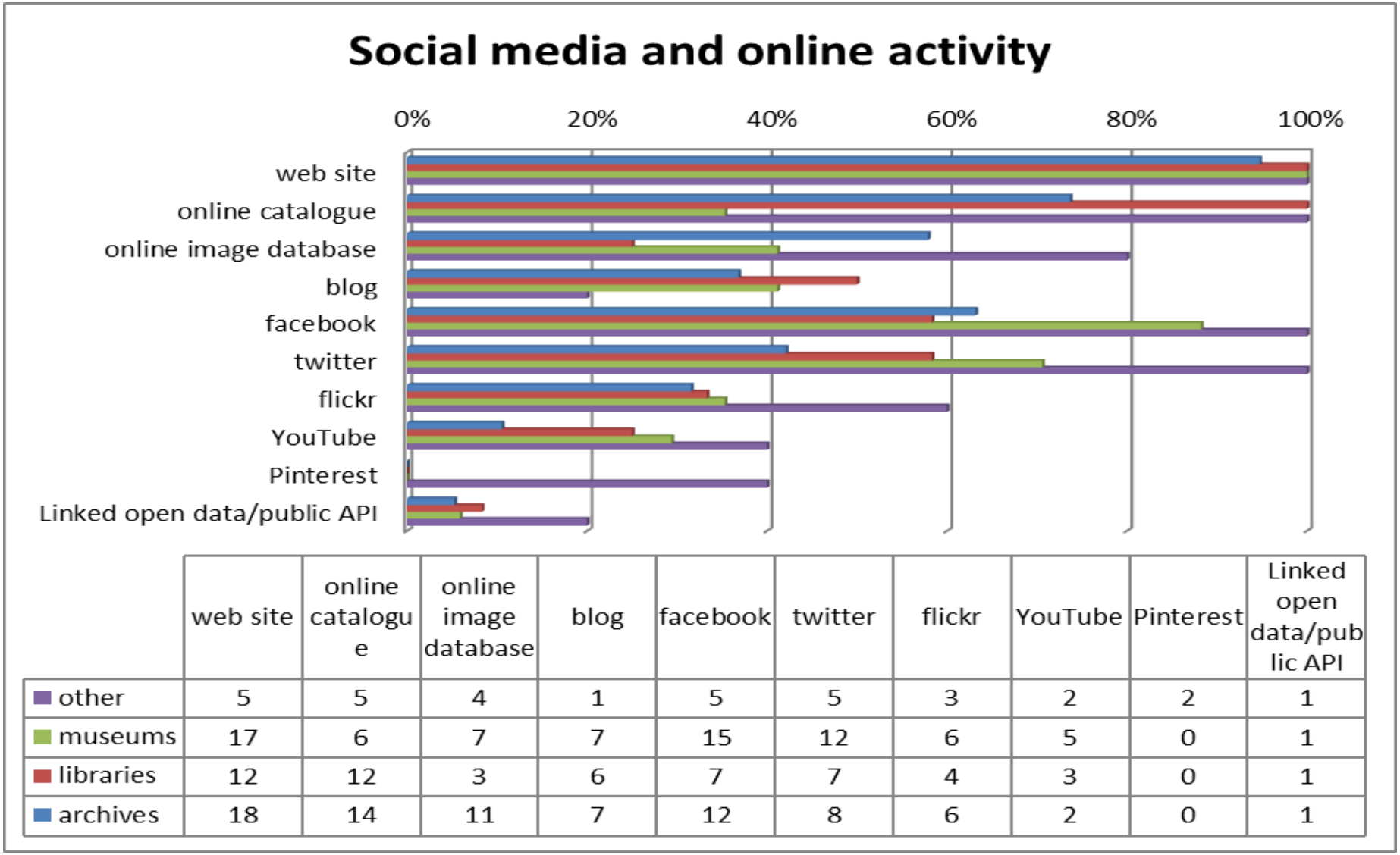
Fig. 3: *Respondents' use of mobile devices*

4.3.5 Question 5: Web presence

The level of mobile activity is low compared with organisations' engagement in social media and other online services, where all respondents indicated some activity (*see Fig. 4*).

All of the library respondents have online catalogues compared with 78% (14/18) of archives and 35% (6/17) of museums. Archives lead the way in having online image databases, although all services are equally likely to have a Flickr page. Museums seem to be more active on Facebook and Twitter, with libraries most likely to have a blog.

One survey respondent expressed the view that blogs were more suitable for project work and the respondent was *"not sure they're necessary for day-to-day".*



	web site	online catalogue	online image database	blog	facebook	twitter	flickr	YouTube	Pinterest	Linked open data/public API
other	5	5	4	1	5	5	3	2	2	1
museums	17	6	7	7	15	12	6	5	0	1
libraries	12	12	3	6	7	7	4	3	0	1
archives	18	14	11	7	12	8	6	2	0	1

Fig. 4: *Social media and online activity*

A number of respondents expressed a desire to engage more via social media but cited lack of capacity and lack of staff expertise as limiting factors:

> *"It is increasingly difficult for small services to keep up-to-date as resources are declining and staff are not expert in new technologies."*

> *"It would be great to have all these and obviously we're not engaging with huge numbers who only use these to source their info by not doing them. However, it's resources into updating and maintaining these and we don't have capacity which is why we're asking volunteers and Friends to help support us."*

4.3.6 Question 6: Is your organisation's website optimised for access from mobile devices?

Less than a quarter of respondents indicated their organisations' websites were optimised for access from mobile devices (see *Table 2*).

Mobile-optimised website?	%
Yes	21
No	23
In development	19
Don't know	38

Table 2:
Response to question "is your organisation's website optimised for access from mobile devices?"

One respondent noted their organisation's website was being redeveloped, including optimisation for mobile phones, but noted that *"this won't affect our catalogue"*. This indicates a potential significant issue for resource discovery by future mobile Internet researchers.

A typical survey response was "*we are restricted by council website and protocol,*" indicating that local authority services, in particular, often have little direct control over technical aspects of their websites.

4.3.7 Question 7: How important do you think it is for organisations to have…?

Respondents were asked to rank in importance a number of technologies to indicate how mobile technologies compared with other IT technologies or social media (see *Fig. 5*).

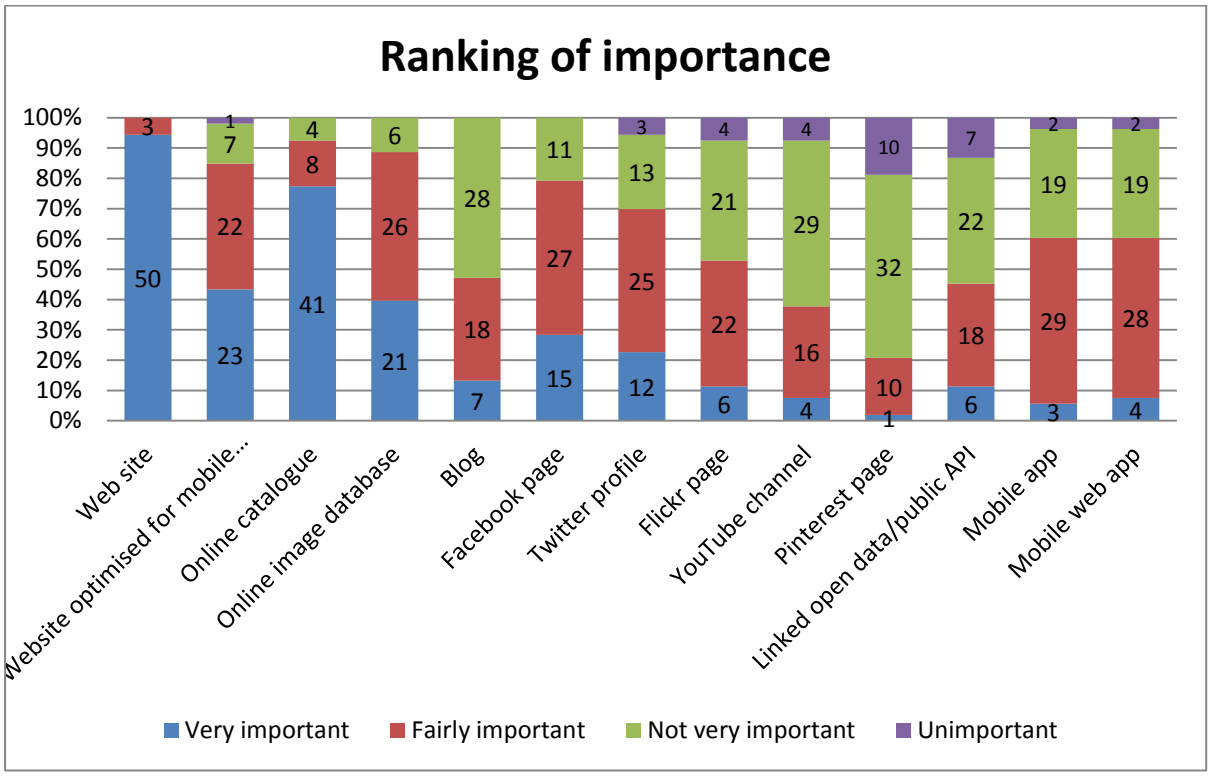


Fig. 5: *Ranking of importance of technologies and social media*

A ranking of "Very important" was given by 94% (50/53) of respondents to websites, and 77% (41/53) to online catalogues. It is surprising that slightly more respondents (43%) (23/53) ranked as "Very important" a website optimised for mobile devices than similarly ranked an online image database (40%) (21/53), especially as only 21% of the respondents' websites were believed to be optimised for mobile devices (*see Table 3*).

One survey respondent emphasised that enabling visitors to identify items of interest in advance is fundamental to their service:

> *"I believe it is important that key things such [as an] online database/image database are available for a world-wide audience… Giving them an ability to see what is available and*

choose items to view before they arrive is the most important issue we needed to address."

Table 3: *Ranking and usage of services and social media*

Rank	Service	Respondents ranking as very/fairly important	Organisations that use/offer the service*
1	Website	100%	98%
2	Online catalogue	92%	94%
3	Online image database	89%	47%
4	Website optimised for mobile	85%	21%
5	Facebook	79%	79%
6	Twitter	75%	66%
7	Mobile app / Mobile web app	60%	23%
9	Flickr page	53%	36%
10	Blog	47%	40%
11	Linked open data/API	45%	9%
12	YouTube	38%	25%
13	Pinterest	21%	2%

* *either specific to the cultural heritage service or as part of parent organisation*

One survey respondent suggests an explanation for the discrepancy by saying that they were aware of the benefits but were

"held back by not enough staff time to fully utilise if we did have them, lack of finance to purchase and maintain, slowness of approval/authorisation in regard to [organisation's] IT security systems and IT policies."

4.3.8 Question 8: Does your organisation have a mobile app/web app?

Of the 53 respondents, 31 (58%) said their organisation had no mobile app or web app, whilst 8 (15%) stated they did not know (see *Fig. 6*). 12 respondents (23%) said their organisation had an app: three for the service alone; four as part of their parent organisation; three for a specific project and two in partnership with others.

Within the museums and libraries sectors, there is a noticeable difference between local authorities and other organisations. 63% of public libraries had no app (compared with 25% of academic libraries). No local authority museum reported having an app, although two of the 12 'other' museums indicated they had an app - one in partnership with other organisations and one for the museum only.

Two local authority archive services indicated they had an app as part of their parent organisation, and one authority said that an app was in development. Of the 'other' archives, one indicated that they had an app as part of their parent organisation and one had an app for a specific project.

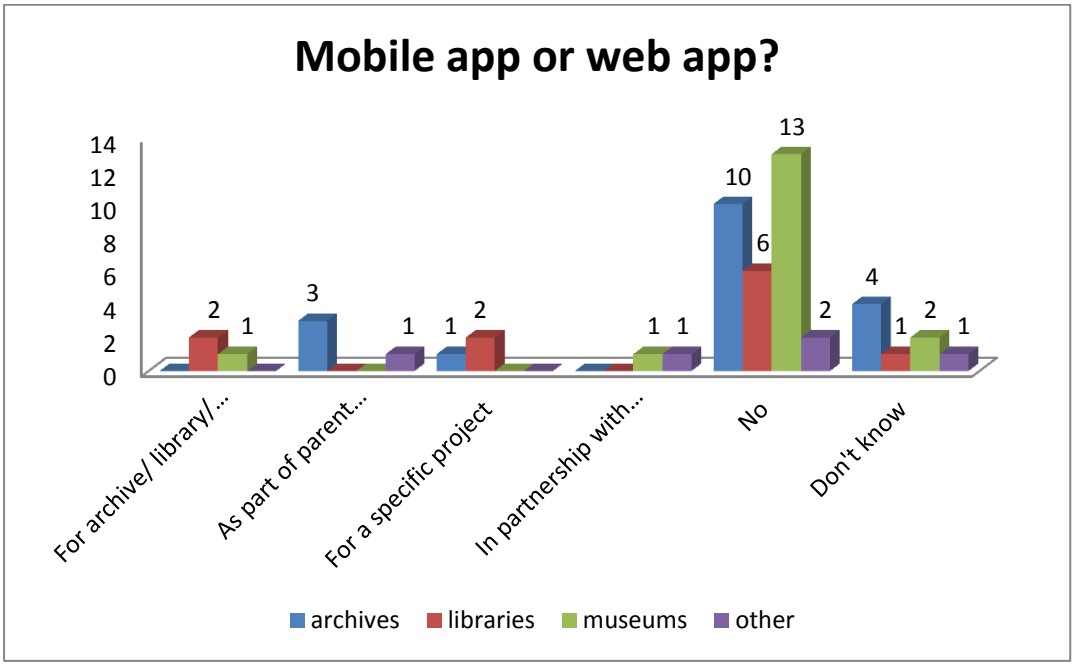


Fig. 6. *Number of respondents' organisations with a mobile app or web app*

Only museums provided information via the survey and case studies on how they were using mobile technology to target personal visitors to their sites, suggesting that mobile activity by archives and libraries may focus more on potential visitors/remote users.

One survey respondent explained the scope of their organisation's app:

> *"Its content covers the museum (tours, films/images/media, extra info about objects) with the option of adding additional content related to temporary exhibitions".*

4.3.9 Question 9: other technology

There is also significant activity by cultural heritage organisations in technologies other than social media (see *Fig. 7*). However, difficulties with corporate IT departments seemed to be common e.g.:

> *"All the 'Under Consideration' items have been approved by* [cultural heritage senior managers]*, but look likely to be blocked by [corporate] IT"*

Libraries are most likely to provide online renewals and reservations, and to communicate via SMS text message. Libraries are also most likely to utilise QR codes, although the survey did not seek to discover what these have been used for and whether their use is ongoing or experimental.

One survey respondent said:

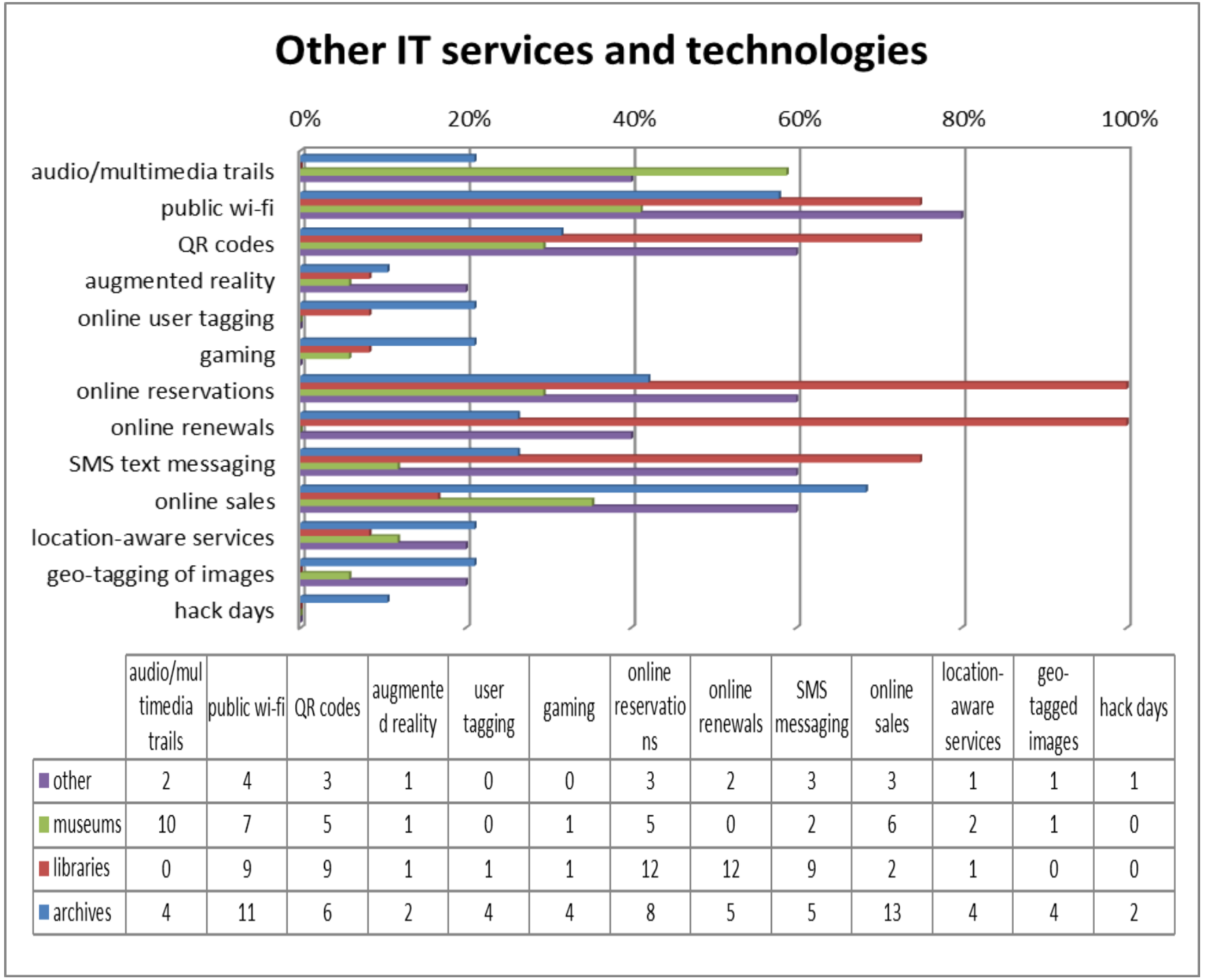
> *"We surveyed all staff (330) on if they knew what QR codes were and if they ever used them. Most people had seen them, most know what they were for, hardly anyone used them. So we aren't doing them at the moment."*

Libraries also lead in the provision of public wi-fi, which is perhaps a natural extension of their provision of Internet access via public PCs. Archives are most active in online sales, hack days, geo-tagging of images, gaming and location-aware services. Unsurprisingly, museums are most active in audio/multimedia trails.

Some survey respondents offered explanations for lack of engagement with new technologies:

> *"we would like to do much more but … we have to wait until we can tap into external funding before we can do anything new and innovative with new technology. The problem is unless you have continued funding it's out of date in nano-seconds."*

> *"Technology itself is only half of the problem; no point in investing in it if all the IT skilled staff to develop apps etc… have either been made redundant or never been recruited in the first place."*



	audio/multimedia trails	public wi-fi	QR codes	augmented reality	user tagging	gaming	online reservations	online renewals	SMS messaging	online sales	location-aware services	geo-tagged images	hack days
other	2	4	3	1	0	0	3	2	3	3	1	1	1
museums	10	7	5	1	0	1	5	0	2	6	2	1	0
libraries	0	9	9	1	1	1	12	12	9	2	1	0	0
archives	4	11	6	2	4	4	8	5	5	13	4	4	2

Fig. 7: *Engagement with IT services and technologies*

4.3.10 Questions 10 and 11: Future external bids and mobile users

60% of survey respondents indicated their organisations were planning to bid for external funding in the next two years and most felt that it was highly/fairly likely that such bids would consider the needs of mobile users (see *Table 4*).

Likelihood of taking account of users of mobile devices in future funding bids	%
Highly likely	32%
Fairly likely	36%
Not likely	23%
Very unlikely	2%
Not likely to make any external funding bids	4%

Table 4:
Response to question "How likely are you to take account of users of mobile phones or tablets in any future bids for external funding?"

Respondents and interviewees seemed keen to develop services, whilst conscious of the current severe financial constraints:

> *"It is all a matter of priorities. We are struggling to stay open following* [organisational] *and local authority cutbacks."*

> *"Although mobile phones and tablets will bring challenges it is our responsibility to find solutions as they will also bring new opportunities."*

4.3.11 Question 12: Benefits of mobile technology

Respondents had fairly balanced opinions of the value of mobile technology (see *Fig. 8* and *Fig. 9*). The main advantages were considered to be:

1. raising the organisation's profile (96% agree/strongly agree)
2. engaging young people (94%)
3. attracting new users (94%)
4. access to catalogue/finding aids (94%)
5. interactive learning (91%)

74% of survey respondents agreed/strongly agreed that partnership working was an advantage of mobile technology.

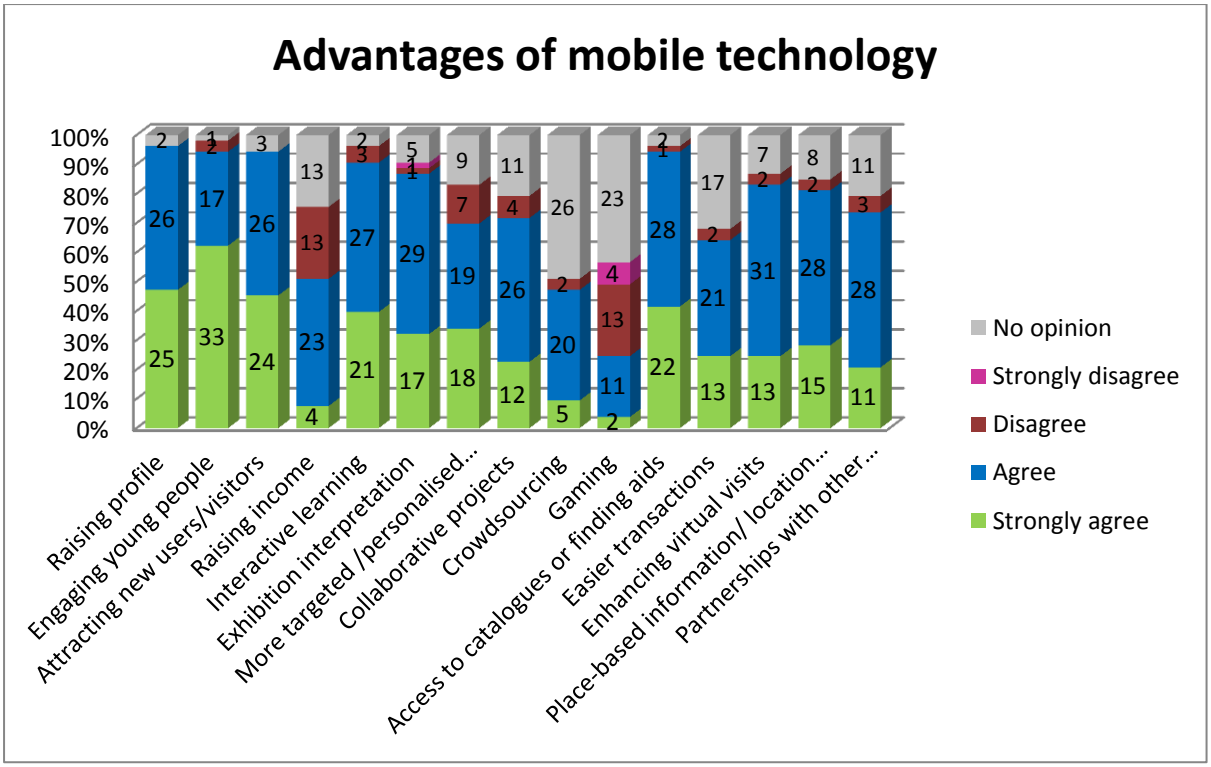


Fig. 8: *Respondents' views on the advantages of mobile technology*

4.3.12 Question 13: Disadvantages of mobile technology

The main disadvantages of mobile technology (see *Fig. 9*) were felt to be:

1. The difficulty in supporting users (83% agree/strongly agree)
2. No staff expertise in the area (75%)
3. Too expensive to develop software (58%)

57% (30/53) of respondents strongly agreed/agreed that a disadvantage of mobile technology was an isolated visitor experience, supporting similar concerns identified in the literature review (section 2.4.2). However, only 38% (20/53) of respondents felt that mobiles distracted visitors' attention from exhibits.

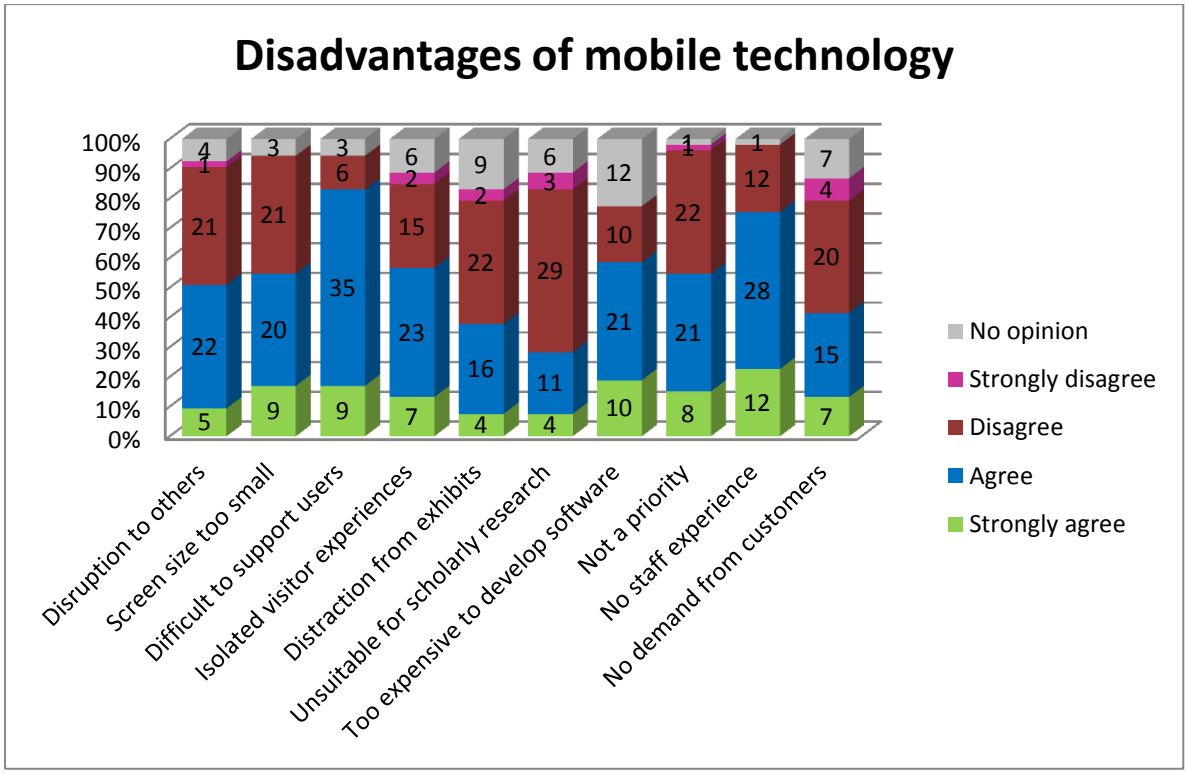


Fig. 9: *Respondents' views on the disadvantages of mobile technology*

4.3.13 Questions 14 and 15: Age and gender

63% of respondents were female and 31% were male (6% gave no answer). Unsurprisingly, given the targeting of senior managers, 57% of respondents were aged over 40 (see *Fig. 10*).

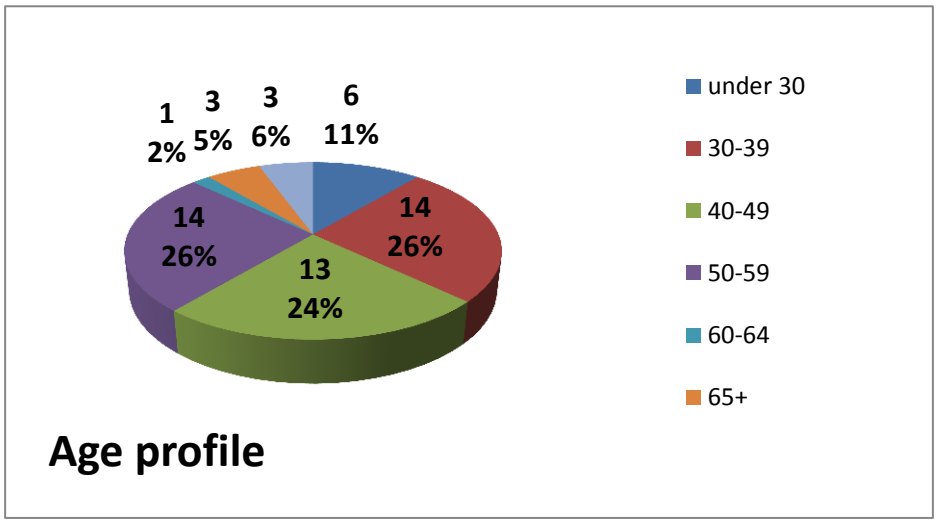


Fig. 10.
Age profile of respondents.

4.3.14 Question 16: Number of years' experience

The seniority of respondents may be reflected in their length of experience in working in the cultural heritage sector (see *Fig. 11*). The 8% per cent of respondents with less than 2 years' experience may indicate that the survey questionnaire was passed to more recently-employed/temporary staff having operational responsibility for IT projects. It may also indicate senior managers moving into cultural heritage services from other sectors.

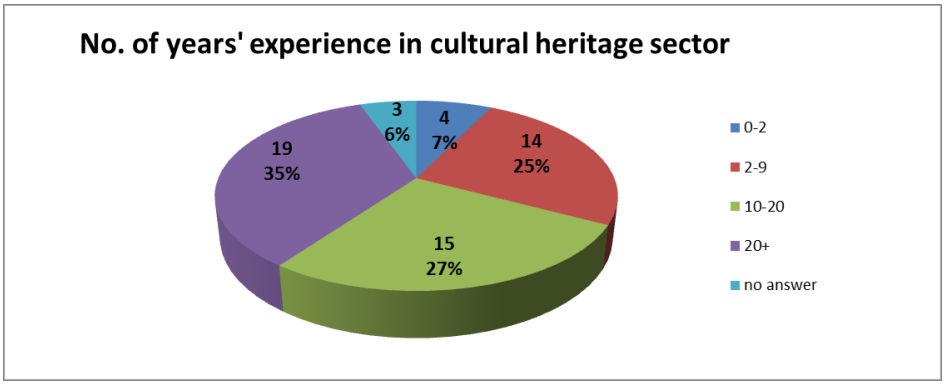


Fig. 11.
Respondents' years of experience working in the cultural heritage sector.

4.4 Case study interviews

One purpose of the questionnaire was to identify individuals willing to be interviewed. 22 respondents expressed such a willingness, although most had no direct experience of mobile apps/web apps so did not meet the interview selection criteria. Based on their survey responses, and using selection criteria outlined in section 3.8.1, three individuals were contacted and agreed to take part in interviews.

Interviewee 1 spoke about an app developed in partnership for a multi-site museum; *Interviewee 2* discussed a standard app from a Library Management System (LMS) supplier; and *Interviewee 3* outlined provision of archive content for a gaming-based tourism app, linked to QR codes on buildings.

The main themes that emerged from the case studies were: strategy; partnerships; funding; user and organisational benefits; staff; sustainability and future plans.

4.4.1 Strategy and activity

Interviewees 1 and 2 indicated that the developer was the primary instigator of their apps (although Interviewee 2 said that the organisation had stated the requirement for an app in its tender specification for a new LMS).

Interviewee 1's organisation was receptive to the developer's proposal not only because of a desire to be associated with innovative technology, but also because it allowed the organisation

> *"to do something that it wanted to do anyway, regardless of the product."* (Interviewee 1)

Both Interviewee 1 and Interviewee 3 used previously-digitised content for their apps:

> *"we wanted to digitise a lot of our content, so the app is… the tip of the iceberg... the bulk lying below the waterline, is actually all of the work that goes into creating content, which we can use on other platforms."* (Interviewee 1).

> *"We have our [name of] website, which brings together our catalogue, the museum's catalogue, the Sites and Monuments Record, so it's sort of come from that. This is the next stage of seeing how we can get some interactivity going."* (Interviewee 3).

In Interviewee 3's case, the organisation's Communications Team instigated the app and the archive service provided geo-tagged historical content by adding GPS co-ordinates to existing catalogue entries. The app was part of a corporate tourism agenda to:

> *"promote the county to people who live here and also to visitors"* (Interviewee 3).

4.4.2 Partnerships and funding

Interviewee 2's app was funded from an existing budget for a new LMS. Interviewees 1 and 3 both had externally-funded projects, although Interviewee 1 was the only case study with several external commercial partners:

> *"We all have our own reasons for joining the project, so you have to appreciate that there will be differences, and that can be a good thing because … they actually have expertise and skills in their own area but, with that, comes the difference in approach to work and the project itself."* (Interviewee 1).

Interviewee 3 had experience of a longstanding partnership with the developer of the current app and commented:

> *"they have a real interest in heritage and in promoting heritage systems and they've been incredibly helpful to us in terms of moving us along… I think we're quite lucky – I would say we've got a very good partnership"*

4.4.3 Advantages and disadvantages

In line with a perceived advantage of mobile attracting new visitors (see *Fig. 8)* Interviewee 1 discussed a "freemium-model" app to entice tourists into paying admission fees and then to a further secondary spend. Income generation is an unashamed aim of having the app:

> *"to push the boundaries of technology, to use collections and to make money"* (Interviewee 1).

For Interviewee 2, the aim was to offer existing users another access point to online services:

> *"an easy way to access library catalogue and customer account information on the move, so people can access it from anywhere."*

However, another advantage was:

> *"the hope is that maybe it does appeal to younger people and also that libraries are seen to be keeping up with the latest advances in technology."* (Interviewee 2).

Interviewee 3 mentioned a particular challenge for rural areas:

> *"There always an issue … in terms of signal… There's the coverage of the mobile network and the speed of any downloads… so we deliberately don't go for things that will take a lot of bandwidth."*

Interviewee 1 advocated embedding mobile services into visitors' existing activities to create a longer-lasting relationship and:

> *"to create opportunities for people to do things they want to do anyway… rather than just expecting people to be thrilled by the gimmicky nature of something on their phone. It should be embedded in real need… It's not letting the tool dictate how it should be used."*

4.4.4 Staff and organisation

Staff attitudes were mentioned by Interviewee 1, where the organisation's app was initially viewed with suspicion:

> *"There was a general feeling that 'oh, this is an app, this is going to replace us'… There was a degree of insecurity…"*

Attitudes did change after reassurance that it wouldn't replace staff roles:

> *"those that I do tell about the app are generally encouraging but I, perhaps naively, expected there would be more energy around the app, and more ownership."* (Interviewee 1).

Staff in Interviewee 2's organisation seem to have been more welcoming of their app:

> *"I think they've been fairly keen that we are trying to make ourselves accessible to people who have different types of*

technology and providing choice. We haven't really encountered any problems with the staff."

None of the interviewees felt that the mobile app would be a significant factor in any future recruitment of staff.

Interviewee 1 spoke of the tensions between existing organisational practices and technological developments, e.g. the tradition of cameras/phones not being permitted in galleries and mobiles being viewed as:

"a capturing device, it's a stealing device - taking stuff home with you that you're not meant to have."

Interviewee 1's organisation has a mobile-optimised website and, in July 2012, mobile devices accounted for 6% of its web traffic (78% of these visits were made using Apple devices) and 21% of its blog traffic (82% using Apple devices). Since March 2012, Interviewee 3's organisation has seen mobile devices account for 10% of all visits to its non-optimised website, with Apple devices again the most popular.

4.4.5 User experience and feedback

Interviewees 1 and 2 commented on the difficulty of obtaining user feedback, despite feedback mechanisms in their apps, as well as user ratings in the App Store. Interviewee 1 had experimented by offering free admission tickets to passers-by in return for feedback on the app. However, this incentive had met with limited success because of download size and visitors' lack of time.

Interviewee 1 also had a small virtual focus group to test the app:

"we wanted to take people with us on the journey in developing the app, so making it free is a good way of doing that and to get people's real feedback."

Interviewee 3's app had not been formally launched and promoted at the time of interview so no user feedback was available.

Two of the interviewees said they had not considered the needs of people with a visual or hearing impairment in developing their app, whilst the third interviewee was not sufficiently involved in development to know.

Interviewee 1 spoke of forthcoming plans to introduce Augmented Reality (AR) within the organisation's app, so that visitors could use their mobile device's camera to put themselves into a picture and create a personalised souvenir. However, with regard to developing mobile content for museum visitors, Interviewee 1 also expressed concerns about visitor flow being impeded if people pause to use devices:

> *"thinking about how people actually use the device within our museum environment is interesting and hasn't really been tackled - there needs to be some research done on that… how people move around in a space and how they would use a mobile device."*

Interviewee 1 spoke of the importance of integration. As "*most people access Facebook and Twitter, and other platforms, via their mobile device*," the organisation deliberately designed the app so that users can share what they are seeing within the app via social media. This integration also helps the organisation:

> *"we're much more likely to create a longer-lasting relationship than we normally would with them, simply because there's a seamless link there using technologies, especially if we provide a free app. It becomes stickier if we're reaching out and using other platforms."* (Interviewee 1).

Interviewee 3's organisation also adopted this approached and advocacy is an important feature of their gaming app which is:

> *"linked to Facebook and allows the customers to share their success and recommendations with their friends"*

4.4.6 Sustainability and future plans

Maintaining funding for mobile services and keeping content up-to-date are important considerations. Interviewee 1's organisation has a four-strand Sustainability Strategy:

> *"[First] advertising and sponsorship … The second thing is getting people into our properties, so the number of enticements which will be in the app. The third thing is secondary spend, so when people actually visit our properties or if they use e-commerce via the app, they'll be spending money … and the fourth way of sustaining the app in the long term will be actually through bespoke products such as … the use of augmented reality to create souvenirs within the app."*

In addition, the organisation hopes that the whole app will be offered for sale as a customisable package for other heritage sites.

Although the current financial constraints are having a severe impact, Interviewee 2 also commented:

> *"Sometimes, at times like this, it does make you more innovative. You know, is there external funding out there? Is there any kind of partnership that you can go into to develop these things in order to enhance the budget you have?"*

Interviewee 3 agreed:

> *"I would always see this as an opportunity for project funding and there are still opportunities for that."*

Future development of the app used by Interviewee 2's organisation is in the hands of the LMS supplier. Any changes are likely to require agreement from all participating authorities:

> *"At the moment, it is very much, "This is the standard app that is offered to authorities"... I'm sure we can request enhancements, but at the moment, it is a standard offering to every authority that has that package."* (Interviewee 2).

Future plans are almost certain to be directed by "*institutional priorities and funding*" (Interviewee 1).

Interviewee 3 felt that providing heritage content to others would increase and that such:

> *"indirect use is going to become more and more significant – people won't be accessing our website necessarily but they'll be accessing our content."*

The following chapter discusses these results in the context of the literature review and original research aims and objectives.

Chapter 5: Discussion

5.1 Introduction

This chapter discusses the results of the survey questionnaire and case studies in the context of the literature review and the research objectives of the study in order to:

- identify the extent and nature of take-up of mobile technology by archives, libraries and museums;
- seek opinions from practitioners in archives, libraries and museums regarding the perceived and potential usefulness of mobile technology within the cultural heritage sector;
- determine why and how mobile solutions have been adopted for specific projects/problems;
- compare and contrast approaches within the different segments of the cultural heritage sector;
- recommend good practice for any future development of mobile services by archive repositories.

5.2 Research objectives: summary of findings

5.2.1 Extent of take-up

The literature review (Chapter 2) outlined the nature of cultural heritage organisations' use of mobile technology. However, the extent of take-up is difficult to establish, as existing quantitative data is limited.

Data on museum mobile activity (see section 2.2) indicates that 12% of museums offer an app (Atkinson, 2012a, para. 1). This corresponds with the findings of the survey carried out for this study, which also found that 12% (2/17) of museum respondents had an app. No existing quantitative data has been found for libraries and archives with which to compare the current study's findings of 33% (4/11) of library respondents and 21% (4/18) of archive respondents having apps (see *Fig. 6*). However, the US-based Library

Journal's Mobile Libraries Survey in 2010 found that 44% of academic libraries and 34% of public libraries offered "some type of mobile services to their customers" (Thomas, 2012b, para. 5), although this is broader than the apps/web apps surveyed in the current study.

The current survey also suggests that libraries and museums are more likely to have stand-alone apps, whilst archives are more likely to be part of a parent organisation's app. However, there is no existing comparable data, so it is not possible to assess whether this is typical.

The disparity noted in section 2.2 of the lack of archive professional literature relating to mobile technology, does not appear to reflect a lack of activity within the archive sector. *Fig. 6* shows comparable levels of activity across the cultural heritage sector, so it seems that archive services are more reticent than libraries and museums in discussing their mobile activity. It is also possible that, as most archive apps appear to be part of a parent organisation, the repository has less ownership of the app and, hence, insufficient knowledge or inclination to discuss it in professional literature.

Levels of engagement with location-based services and geo-tagging of images are low (see *Fig. 7*), although archive services appear to be leading the cultural heritage sector. However, without comparative data, it is not possible to determine whether these results are representative of activity outside the region.

5.2.2. Practitioner opinions

Responses to the survey suggest that levels of activity by cultural heritage organisations do not necessarily indicate the degree of importance attached to those activities (see *Table 3*).

The survey suggests high levels of engagement with social media and IT services in general (see *Fig. 4* and *Fig. 7*). This seems to support the findings

of the literature review (see section 2.5.4) that archive services tend to concentrate on social media users rather than mobile Internet users.

It is surprising that only 25% (13/53) of respondents agreed that gaming was an advantage of mobile devices (see *Fig 8*). Gamification, based on multi-user social and location-based experiences, has been a feature of activities discovered during the literature review (see section 2.4.3) and is an important element of Interviewee 3's app (see section 4.4). It will be interesting to see if this attitude changes following the introduction of a gaming app in the Library of Birmingham when it opens in 2013 (Singleton, 2012).

The lack of implementation of services perceived as important is likely to indicate practical constraints such as financial, staff skills/capacity or corporate IT restrictions, which were all factors identified by respondents as difficulties/disadvantages in adopting IT innovations (see section 4.3.5). However, there is no existing data with which to compare these findings.

5.2.3. Adoption of mobile solutions

Determining why and how mobile solutions have been adopted has been largely achieved through case study interviews and qualitative comments by survey respondents. As noted in section 2.3, there is little about the 'why' of mobile in the literature.

One survey respondent said there was no user demand for mobile services. Analysis of existing web traffic may assist in anticipating demand but, with the rapid increase in smartphone take-up and in mobile web users (see section 2.1) and with 32% of Internet users obtaining information from public authority websites in 2011 (Office for National Statistics, 2011a, p. 4), it would be logical to expect people increasingly to seek to engage with cultural heritage organisations via mobile devices, as experienced by Interviewees 1 and 3 (see section 4.4.4).

Although there are cautions against adopting mobile solutions because of the appeal of cutting-edge technology (see section 2.3), 96% of survey respondents felt an advantage of mobile technology would be to raise the organisation's profile (see *Fig. 8*). Whilst innovation is important for services to develop and to inform wider practice:

> at a time when budgets are being squeezed across the board, experimenting with mobile is a risk many organisations simply cannot afford to take (Atkinson, 2012c, para. 2)

The partnership approach adopted by Interviewee 1's organisation (section 4.4.2) seems an attractive means of obtaining external funding to create an innovative mobile product, and may indicate why initiatives are currently mostly developer-led (section 4.4.1). Developers have the technical knowledge to develop bids whilst heritage organisations provide content (as discussed by Interviewee 3 (section 4.4.6). Interviewee 3's strong technical partnership (see section 4.4.2) has also enabled continuing innovation. This experimentation, combined with a sound sustainability strategy (see section 4.4.6) seems to be a model that could be worthy of wider adoption.

All of the case studies demonstrate a strategic approach based on existing service priorities, user activity or anticipated demand (as suggested by the literature review, section 2.3). However, a degree of opportunism was evident in two of the cases (see section 4.4.1).

Re-purposing existing data, whether via 'appifying' the library catalogue (Interviewee 2), using existing digital content in a new app (Interviewees 1 and 3) or adding GPS codes to catalogue entries (Interviewee 3) seems an efficient use of resources. Walsh (2012, p. 82-83) recommends geo-tagging everything you do so that others can re-purpose your data in ways that work for them.

5.2.4. Cross-sectoral approaches

The literature review (sections 2.4-2.6) suggested that:

- museums are most likely to focus on 'edutainment' experiences for visitors;
- archives are more likely to be concerned with resource discovery by intending visitors;
- libraries are most likely to be active in enabling mobile transactions for remote users.

This is partly confirmed by the findings of this study. For example, Interviewee 2's organisation purchased an app as part of their library management system for the purpose of facilitating transactions by remote users. Similarly, the survey respondents from museums (see section 4.3.8) confirmed the literature review finding that using mobile devices for narratives to accompany visitors on the move is a key feature of museum apps (see section 2.4.2).

However, the situation is not as simplistic as the literature review suggests. For example, Interviewee 1's organisation has an unashamed aim of using their app to target non-visitors and convert them into paying customers, although it also contributes to the 'Extended Visit' experience beyond the museum's walls (see section 2.4.2). Interviewee 3's app takes geo-tagged data from the archive catalogue but supports a corporate tourism initiative (see section 4.4.1) rather than seeking to encourage visits to the repository.

The fact that two-thirds of the case studies integrate mobile content with social media platforms so that users can share activities (see section 4.4), confirms the suggestion that mobile services are not stand-alone but are one element in a range of access points (see section 2.7).

5.2.5. Future development of mobile services

Regarding future development of mobile services by archive repositories, it seems that a mobile-optimised website should become a standard level of service, as suggested by the literature review (section 2.5.2) and supported by survey respondents' ranking of this as important (see *Fig. 5*).

Most survey respondents for this study consider it likely that any future funding bids will take into account mobile users (section 4.3.10), which seems to support the concept that "the future of mobile is the future of computing" (Hanson, 2011a, p. 34). It's not about whether users will access services via mobile devices, but what sort of experience they will have (Cummings, Merrill & Borelli, 2010, p. 34).

Digitisation of archive sources has been possible thanks to grant-funded, and often collaborative, projects (Bültman, Hardy, Muir & Wictor, 2006, p. 106). As suggested by Interviewees 2 and 3 (see section 4.4.6), similar externally-funded partnership projects are likely to be a way of developing mobile services in the future. *Fig. 6* suggests that mobile-related partnership activity in the West Midlands region is currently limited, although with 74% of survey respondents considering it an advantage of mobile technology (see *Fig. 8*), it is likely that there will be future activity.

Although outside the geographical scope of this study, The *Hidden Newcastle* app (Henderson, 2012), created by a partnership of Tyne and Wear Archives and Museums with Newcastle Libraries, may be worthy of investigation as a potential model for other collaborative projects. Once material becomes available digitally, there is

> little to differentiate archives, libraries and museums that just become different aspects of the one *wunderkammer* (Moss, 2008, pp.77-78).

Notwithstanding the challenges of partnership working (see section 4.4.2), if the customer is at the heart of the service (section 2.3), then collaborating to develop services to fit with elective mobile use (section 2.5.4) supports the assertion that

> it's not just about building the tools anymore. Now it's about what people use the tools to do (Rheingold, 2002, p.xv).

5.3 Research question

This study's original research question was: How and why (or why not) are archive services embracing mobile technology and how does this compare with the approach taken by libraries and museums?

The findings of this study assist in answering this question by obtaining quantitative data relating to:

- organisations having apps/mobile apps/mobile-optimised websites;
- levels of engagement with IT services and mobile activities (e.g. QR codes, social media);
- relative ranking of importance and advantages/disadvantages of mobile technology and other IT services by cultural heritage practitioners;
- usage of mobile devices by cultural heritage practitioners.

In addition, the qualitative data obtained from survey respondents and case study interviewees suggest explanations for engagement and non-engagement with mobile technology, give insights into staff, user and organisational experiences, and offer indications of future plans.

5.4 Conclusion

Although levels of mobile activity amongst cultural heritage organisations are currently low, it is likely that this is a growth area, based on increasing levels of mobile Internet access (section 2.1) and likely future plans of respondents (section 4.3.10).

It is hoped that the results of this study will help to inform future service development by providing quantitative and qualitative data that may be used for future comparative studies.

The following chapter summarises the study and aims to assist readers in evaluating the validity and transferability of the findings of this research.

Chapter 6: Conclusion

6.1 Introduction

Overall, this study aimed to examine current practice and consider the research question: How and why (or why not) are archive services embracing mobile technology and how does this compare with the approach taken by libraries and museums? In order to answer this, five objectives were identified and are revisited in this chapter to assess how far they have been achieved.

The methodology is reflected upon and any lessons learned or advice to future researchers is explained. Suggestions are also made for future research.

6.2 Review of aims and objectives

Objective 1: identify the extent and nature of take-up of mobile technology by archives, libraries and museums

A review of the available literature indicated the broad themes of: technology; user experiences; organisational priorities. These themes informed the formation of questions for the research instruments.

Using the West Midlands as the geographical focus of the study (see section 3.4), qualitative and quantitative data was acquired through a mixed-methods approach of a survey questionnaire and semi-structured interviews. The nature and extent of activity discovered is discussed in section 5.2.

Objective 2: seek opinions from practitioners in archives, libraries and museums regarding the perceived and potential usefulness of mobile technology within the cultural heritage sector

As above, the questions to determine opinions were established from the literature themes and focused mainly on importance ranking and Likert-type interval response scales, as outlined in chapter 3.7. The findings (see section 5.2.3) indicate that levels of activity do not necessarily reflect the degree of importance attached to them. In the absence of other comparable data, further research to confirm this finding, and to determine reasons for it may be useful.

Objective 3: determine why and how mobile solutions have been adopted for specific projects/problems

This objective has been achieved through qualitative data obtained from case study interviews and survey responses. However, owing to low levels of activity, it is difficult to determine how far the findings detailed in section 5.2.3 are more broadly applicable. Further research encompassing other geographic areas would enable comparisons.

Objective 4: compare and contrast approaches within the different segments of the cultural heritage sector

This objective was achieved by the triangulation of quantitative and qualitative data from the literature review, survey questionnaire and case study interviews. Conclusions were derived from type of user experience and categories of engagement.

Whilst the boundaries are converging between organisations and types of mobile engagement, it is possible to propose an overarching, if rather simplistic, framework of: museums focusing on 'edutainment' and targeting physical visitors; archives focusing on resource discovery and targeting intending/potential visitors; and libraries focusing on transactions and targeting remote users.

Collaborations between partners, activity by cross-sectoral organisations, or content provision for others may be more likely to blur the boundaries of this framework and may be more location-based (e.g. *Hidden Newcastle* and

Manchester Time Machine apps). The findings detailed in section 5.2.4 and this broad framework may give future researchers a basis for comparison.

Objective 5: recommend good practice for any future mobile developments by archive repositories.

During the study it has been possible to draw conclusions from the literature, the survey and the semi-structured interviews that have been developed into recommendations of good practice for repositories seeking to implement mobile technology. These are summarised below.

6.3 Recommendations of good practice

1. Optimise website for mobile access

Although this may not be within the direct control of the cultural heritage service, staff should be able to obtain website statistics of mobile access, establish if online catalogues are mobile-accessible and, if not, make representations to make them so.

2. Collaborate with partners

Through cross-sectoral and technical collaborations, users will have access to more resources, partners will benefit from each other's strengths and funding may be easier to obtain. In the same way that physical convergence means archive services are often part of a shared 'heritage centre', virtual convergence has the potential to give users a seamless service based on user need and location, rather than document storage.

3. Consult potential and existing users

Find out what users actually want to do, what device(s) they have and how they want to interact with you (Walsh, 2012, p. 54). An app with novelty value and no basis in need is likely to be quickly deleted by busy consumers.

4. Ensure a solid strategic base for activities

Whilst it may be pragmatic to take advantage of an opportunity, opportunistic decisions still need to have a sound strategic basis, clearly linked to organisational priorities and embedded in core services and social media platforms. Without this, activities are unlikely to be sustainable.

5. Encourage experimentation

Mobile technology is about more than just having an app. It offers other options for personalised and targeted services (e.g. SMS, QR codes) or taking advantage of the ubiquitous nature of the devices for user-contributed content. These may be low/no-cost options requiring little investment either financially or in staff time. However, now that there have been several projects, Walsh (2012, p. 127) advocates seeking evidence from existing pilots rather than instigating new ones.

6. Exploit place-based initiatives

Location-based developments offer perhaps the most exciting potential for mobile development, although geo-referencing needs to be included in record descriptions (section 4.4.1; Stephens, 2011; Walsh, 2012). Resources may then be available in the location where they have most meaning (Dwiggins, 2010).

7. Share good-practice and technical skills

As training budgets are squeezed, running courses on mobile technology for archives staff may not be viable. However, there are many opportunities for information sharing, e.g. online forums, printed journals and regional meetings. Hopefully, archive services who have engaged in hack days, experimented with AR, QR codes, location-aware services etc. will be less reticent in making their experiences more widely known to the profession.

6.4 Lessons learned

No major obstacles were encountered during the research, although it was disappointing that neither developer approached for interview was able to be involved. With a developer's viewpoint missing from the study, there may be gaps in the findings and recommendations.

The lack of comparative quantitative data noted in section 5.2.1 caused difficulties in comparing the findings of this study with other research. This may be resolved in the future as awareness of mobile Internet access increases. With hindsight, quantitative data could have been obtained about mobile-optimised websites and levels of access from mobile devices e.g. by making Freedom of Information requests to publicly-funded cultural heritage organisations.

6.5 Suggestions for further study

As noted in section 2.3, existing literature largely focuses on examples of the use of the technology, rather than reasons for its adoption and the impact on customers/organisations. Further research, such as cognitive studies into how people use mobile devices in cultural heritage spaces, as suggested by Interviewee 1 (section 4.4.5) and Atkinson (2012a), would inform future practice.

Also, QR codes seem to be popular amongst heritage practitioners and developers but slow to be adopted by consumers (sections 2.6.1, 2.6.3, 4.3.9). Research would be useful into the reasons why, whether other technologies (e.g. NFC) may be more appropriate and whether it is cost-effective for organisations to continue with QR codes.

Mobile devices are dependent on phone networks and wi-fi coverage. This is a particular challenge in rural areas where such infrastructure is limited. Comparative studies of rural/urban experiences may be beneficial for future development, especially with the forthcoming introduction of 4G networks (Garside, 2012). As indicated in section 3.4, the West Midlands was selected

as a convenience sample, so future research into other geographical areas would be beneficial in establishing whether the results of this study are typical of other areas.

Future research would be advisable to assess any potential non-response bias, as discussed in section 3.9.3, especially as a result of the comparatively low survey response from museums and academic libraries.

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Appendix 1: List of key journal titles searched

American Archivist

ARC

Archivaria

Australian Society of Archivists' Bulletin

The Electronic Library

Journal of the Society of Archivists

Library Journal

Library Hi Tech

Library Hi Tech News

Library and Information Science Research

Library and Information Research News

Journal of the American Society of Information Science and Technology

Library and Information Research

Information Technology and Libraries

Library Technology Reports

Museums Journal

Museums Practice

Partnership: the Canadian Journal of Library and Information Practice and Research

Appendix 2: Survey questionnaire

The self-administered online survey was carried out using Smart Survey (www.smart-survey.co.uk). The questions asked were as follows:

Mobile Technology in the Cultural Heritage Sector

Survey Questionnaire Page 1 of 15

This research into mobile technology is being undertaken by Tracey Williams, as part of a Master's dissertation for the MSc (Econ) Archive Administration course at Aberystwyth University, under the supervision of Sarah Higgins.

DURATION: The questionnaire should take no more than 10 minutes to complete.

CONFIDENTIALITY: All information supplied will be treated confidentially and no individuals or specific organisations will be identified in the report.

DATA SECURITY: The information will be kept securely and for only as long as necessary to
a) analyse the research data and
b) report on the research and its findings

Agreement Page 2 of 15

By completing this questionnaire you agree to the following statements:

- **I understand that my participation in this research will involve completing a questionnaire about my opinions on the use and value of mobile technology and other online services.**
- **I understand that participation in this study is entirely voluntary and that I can withdraw from the study at any time without giving a reason.**
- **I understand that the information provided by me will be used anonymously and will not be traced back to me.**
- **I understand that I am free to ask any questions at any time**

and am free to discuss my concerns with Tracey Williams [tdw08@aber.ac.uk] at any time.

- **I agree that by completing this questionnaire I am giving my consent for the data I have provided to be used for the process of research.**

∗ 1) Please tick to agree to the statements above and continue with the questionnaire.

	Yes
I accept the statements above	☐

Workplace

Page 3 of 15

∗2) Do you work in

- ◯ a local authority archive service
- ◯ other archive or special collection
- ◯ a local authority museum / gallery
- ◯ other museum / gallery
- ◯ a public library
- ◯ an academic library
- ◯ Other: (please specify)

∗ 3) In which country/region is your workplace?

Your internet access

Page 4 of 15

∗ 4) Do you access the Internet yourself via a mobile phone or tablet device?

- ◯ Every day
- ◯ At least once per week

- ◯ At least once per month
- ◯ Less than once per month
- ◯ Never

Your mobile devices

∗5) Do you personally own / use a smart phone or tablet?
(please tick all that apply)

- ☐ iPhone
- ☐ Android phone
- ☐ Blackberry
- ☐ Android tablet
- ☐ iPad
- ☐ I don't use a smart phone or tablet
- ☐ Other, please specify:

Web presence

∗6) Does your museum / library / archive have any of the following?

	Yes	No	Don't Know	Under Consideration	As part of parent organisation site
Web site	◯	◯	◯	◯	◯
Online catalogue	◯	◯	◯	◯	◯
Online image database	◯	◯	◯	◯	◯
Blog	◯	◯	◯	◯	◯
Facebook page	◯	◯	◯	◯	◯
Twitter profile	◯	◯	◯	◯	◯
Flickr page	◯	◯	◯	◯	◯

YouTube channel	◯	◯	◯	◯	◯
Pinterest page	◯	◯	◯	◯	◯
Linked open data/public API	◯	◯	◯	◯	◯

Additional comments:

Your organisation's website

Page 7 of 15

***7) Is your organisation's website optimised for access from mobile devices**

- ◯ Yes
- ◯ No
- ◯ Don't know
- ◯ In development

Additional comments:

Websites

Page 8 of 15

***8) How important do you think it is for archives/ libraries/ museums to have**

	Very important	Fairly important	Not very important	Unimportant
Web site	◯	◯	◯	◯
Website optimised for mobile devices	◯	◯	◯	◯

Online catalogue	◯	◯	◯	◯
Online image database	◯	◯	◯	◯
Blog	◯	◯	◯	◯
Facebook page	◯	◯	◯	◯
Twitter profile	◯	◯	◯	◯
Flickr page	◯	◯	◯	◯
YouTube channel	◯	◯	◯	◯
Pinterest page	◯	◯	◯	◯
Linked open data/public API	◯	◯	◯	◯
Mobile app	◯	◯	◯	◯
Mobile web app	◯	◯	◯	◯

Additional comments:

Mobile app

***9) Does your organisation have a mobile app or mobile web app**

- ☐ For archive/ library/ museum only
- ☐ As part of parent organisation's app
- ☐ For a specific project
- ☐ In partnership with other organisations
- ☐ No
- ☐ Don't know
- ☐ Other: (please specify)

Please indicate the purpose/scope of the app:

Other technology

***10) Has your organisation implemented or used any of the following?**

	Yes	No	Don't Know	In Development	Considering
Audio or multimedia tours / trails	◯	◯	◯	◯	◯
Public wi-fi	◯	◯	◯	◯	◯
QR codes	◯	◯	◯	◯	◯
Augmented reality	◯	◯	◯	◯	◯
Online user tagging (e.g. of documents or objects)	◯	◯	◯	◯	◯
Gaming	◯	◯	◯	◯	◯
Online reservations	◯	◯	◯	◯	◯
Online renewals	◯	◯	◯	◯	◯
SMS text messaging	◯	◯	◯	◯	◯
Online sales (e.g. of images)	◯	◯	◯	◯	◯
Location-aware services	◯	◯	◯	◯	◯
Geo-tagging of images	◯	◯	◯	◯	◯
Hack days for developers	◯	◯	◯	◯	◯

Additional comments:

External bids

∗11) Is your organisation planning to bid for external project funding in the next 2 years?

- ◯ Yes
- ◯ No
- ◯ Don't know

Please indicate the purpose/scope of the bid:

∗12) How likely are you to take account of users of mobile phones or tablets in any future bids for external funding?

- ◯ Highly likely
- ◯ Fairly likely
- ◯ Not likely
- ◯ Very unlikely
- ◯ Not likely to make any future funding bids

Additional comments:

Benefits of mobile technology

∗13) What benefits do you think mobile phones or tablets could bring to libraries, archives and museums and/or their visitors?

	strongly agree	agree	disagree	strongly disagree	no opinion
Raising organisation's profile	◯	◯	◯	◯	◯

Engaging young people	◯	◯	◯	◯	◯
Attracting new users/visitors	◯	◯	◯	◯	◯
Raising income	◯	◯	◯	◯	◯
Interactive learning	◯	◯	◯	◯	◯
Exhibition interpretation	◯	◯	◯	◯	◯
More targeted /personalised services	◯	◯	◯	◯	◯
Collaborative projects	◯	◯	◯	◯	◯
Crowdsourcing	◯	◯	◯	◯	◯
Gaming	◯	◯	◯	◯	◯
Access to catalogues or finding aids	◯	◯	◯	◯	◯
Easier transactions	◯	◯	◯	◯	◯
Enhancing virtual visits	◯	◯	◯	◯	◯
Place-based information/ location awareness	◯	◯	◯	◯	◯
Partnerships with other organisations	◯	◯	◯	◯	◯

Additional comments:

Disadvantages of mobile technology

***14) What disadvantages/challenges do you think mobile phones or tablets bring to libraries, archives and museums and their visitors**

	strongly agree	agree	disagree	strongly disagree	no opinion
Disruption to other visitors/users	◯	◯	◯	◯	◯

Screen size too small to be useful	◯	◯	◯	◯	◯
Difficult to support users if any problems	◯	◯	◯	◯	◯
May lead to isolated visitor experiences	◯	◯	◯	◯	◯
Distraction from exhibits	◯	◯	◯	◯	◯
Unsuitable for scholarly research	◯	◯	◯	◯	◯
Too expensive to develop software	◯	◯	◯	◯	◯
Not a priority in current climate of austerity	◯	◯	◯	◯	◯
No staff experience in this area	◯	◯	◯	◯	◯
No demand for this from users/visitors	◯	◯	◯	◯	◯

Additional comments:

About you

This information is requested for statistical purposes only and no identifying information will be included in the final research. Your name is requested only to aid the future removal of your responses from the survey, should you request this, and will not be used in the survey analysis.

15) Name

16) Job title

17) Organisation

18) Age

19) Gender

20) Number of years you have worked in archives/libraries/museums

Thank you

21) Thank you very much indeed for completing this survey.

If you have any queries about the survey, require further information or wish to withdraw your participation, please contact Tracey Williams (tdw08@aber.ac.uk).

In addition to this questionnaire, some in-depth interviews may also be required.

If you would be willing to be invited to participate in an interview if necessary, please add your name and e-mail address into the box below.

Appendix 3: Information sheet and consent form for interviews

Mobile Technology and Cultural Heritage Organisations

Research for MSc (Econ) Archive Administration at Aberystwyth University

You are invited to take part in an interview for the above dissertation research. If you decide to take part, you will be given this information sheet to keep and will be asked to sign a consent form.

Before you decide whether or not to be interviewed it is important that you understand why the research is being done and what it will involve. Please read the following information carefully.

Introduction to the study

I am a distance-learning postgraduate student at the Department of Information Studies, Aberystwyth University and I shall be carrying out the research as part of a master's dissertation. The study concerns the use of mobile technology by cultural heritage organisations. For the purposes of this study, mobile technology refers to handheld mobile devices (e.g. mobile phones, PDAs, and tablets) rather than netbooks or laptop computers. Cultural heritage organisations include museums, libraries and archives.

Once completed, a copy of the dissertation will be available to researchers at the Thomas Parry Library, Aberystwyth University. It may also be made available on the Internet and may be the subject of future articles in museum, library and archive journals.

Purpose of the study

The study arose because of perceived differences in the extent of coverage of the topic amongst the professional literature of museums, libraries and archives. It is intended that the study will compare approaches from a range of cultural heritage organisations, investigating how and why (or why not) mobile solutions have been adopted and seeking opinions from practitioners regarding perceptions of the potential usefulness of the technology. The study will include case studies from each sector and from software developers and the aim is to identify best practice and suggest future trends.

Your involvement

Your organisation was chosen to be one of the case studies because of your experience of using mobile technology within your service or of developing software for the cultural heritage sector.

If you agree to be interviewed for this research, I anticipate an interview being carried out in person sometime during August or early September 2012, at your place of work, unless you would prefer a telephone interview.

The interview will be semi-structured and include questions relating to your experience so far of using mobile technology and how it came to be introduced in your organisation, as well as any lessons

learned, any difficulties to be overcome, user demands/feedback, future plans and any advice you would give to people planning to introduce similar services. You have the right not to answer any of the questions that are asked and may stop the interview at any time. You are also welcome to raise any other matters that you think are relevant.

If you are willing to be interviewed please respond to this e-mail and I shall then contact you to agree a convenient day and time for us to talk. You are, of course, free to withdraw your participation at any time before the research is submitted to Aberystwyth University, without giving a reason.

Please note the following procedures about our conversation/interview:

- **Duration**: The interview will be in person and should take no more than about 30-40 minutes of your time.
- **Recording**: With your permission, I should like to record the interview in order to ensure greater accuracy than with note-taking alone. You have the right to ask for the recorder to be switched off at any point during the interview. The recording will be used only for this piece of research, and will be used in accordance with UK data protection legislation and the ethical research procedures of Aberystwyth University.
- **Confidentiality and anonymity**: Information you give will be treated confidentially and will be anonymised in the report, unless you consent in writing before or at the time of interview that your organisation may be mentioned by name in the report.
- **Data security:** The information will be kept securely, and for only as long as necessary to: a) analyse the research data and b) report on the research and its findings.
- **Opportunity to correct inaccuracies:** I shall supply you with a transcript of your interview, so that you may check it and advise me of any inaccuracies.

Contact details for further information

If you have any questions about the research or would like any further information, please do not hesitate to contact me:

Tracey Williams
e-mail: *[removed]*
daytime *[removed]*
mobile tel.: *[removed]*

If you have any concerns about how this research is being conducted, or have any questions that you prefer not to raise with the researcher, please contact my dissertation supervisor: Sarah Higgins, e-mail: *[removed]*, tel.: *[removed]*.

Thank you for taking the time to read this information sheet. I look forward to hearing from you.

Tracey Williams

Consent form

Study: Mobile Technology and Cultural Heritage Organisations

Research project for Master's Dissertation (MSc (Econ) Archive Administration, Department of Information Studies, Aberystwyth University)

Researcher's contact details:

Tracey Williams

e-mail: *[removed]*; daytime tel.: *[removed]*; mobile:[*removed]*

Please tick box

1. I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions about the study and they have been answered for me. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time before the study is submitted to the university, without giving any reason. ☐
3. I have received sufficient information about my role and agree to take part in the above study. ☐
4. I agree to the interview being audio-recorded. ☐
5. I agree to my organisation being named as a 'case study' in the final report ☐
   OR
   I wish my contribution to be anonymised in the final report ☐
6. In case of concern, I have been given the contact details of the researcher and of a supervisor at the Department of Information Studies, Aberystwyth University ☐

Name of participant (IN BLOCK CAPITALS)	**Signature**	**Date**

Appendix 4: Case study questions for archives, libraries and museums

CASE STUDY SEMI-STRUCTURED INTERVIEWS – questions for archives, libraries and museums

Theme	Question	Further info/probing questions	Rationale
Introduction	Explanation of the research and that we are talking about mobile devices such as phones/tablets, not netbooks. Please can you confirm that you've received the information sheet about the research and that you're happy to participate in this interview? Do you agree to the interview being recorded, as outlined in the information letter? Do you wish your contribution to be anonymised or are you willing for you organisation to be identified in the final report?	I will send you a copy of the transcript of the interview so that you are able to make any corrections. You remain free to withdraw your participation at any point. *Signing of consent form (if not already signed in advance).*	Compliance with research ethics requirements. Ensuring interviewee understands purpose and context of research, and their right to withdraw consent at any time.
	Please tell me your job title and outline your main role and responsibilities?	Who do you report to? How long have you been in the role?	Background information to establish individual's position in the organisation and their main responsibilities.
Strategy	Please describe to me what your organisation has been doing with mobile technology?	How did it come about? Who thought of it? Why was mobile chosen? Were any alternatives considered? Is it something completely new or an extension of an existing service/project? Is it part of a larger project?	Scene setting, and to hear the interviewee's summary of activity. I want to determine whether a strategic approach was taken and how far it was top-down/bottom-up, opportunistic/pragmatic, driven by developers/cultural heritage organisations/parent organisations. Is it a

			logical extension of existing activity (e.g. a development from audio tours)
	Has there been any demand for this from users?	Do you know whether/what proportion of people are accessing your website from mobile devices? Have there been any comments/complaints from people trying to access your website from their phone/tablet?	To determine whether any statistical analysis has been carried out on web statistics. To establish whether the introduction of mobile services is staff-driven or user-driven.
Project/service	What's the purpose of the project/using mobile technology in the way you've outlined?	What do you hope to achieve? Who is the target audience? (Remote users? Physical visitors? Non-users?)	To determine what the aims of the project/service development were at the outset.
	How it is being funded?	Existing budget? External funding (who?) Specific funding for this or is it part of a wider funding stream?	To establish whether mobile technology is mostly being introduced as an externally-funded project or whether costs are being met from existing budgets.
	What content is required and how is the content being created?	Staff (existing or fixed-term project workers?) Volunteers? Developers?	To determine how far existing staff are involved with mobile projects.
	Which organisation(s) is/are involved in the project?	Parent organisation/other departments? External partners?	To find out if organisations are mostly going it alone or seeking to join with other partners and, if so, who.
	What consideration has been given to those who don't have access to phones/tablets?	Are equivalent services already accessible via the website? Would you consider loaning devices to customers to try out? Have you considered alternative non-mobile options - e.g. specifying web links as	To see how far non-mobile users will be able to be involved/see the outcomes of the project/service.

		well as QR codes, accessible from desktop PCs	
	Is the project accessible to people with a visual or hearing impairment?	Have these disabilities been taken into account in the design of the project?	To find out whether any assessment of accessibility has been considered.
	Can you tell me about anything that didn't go as expected or that you wish had been done differently?	What were the main learning points? What advice would you give to someone embarking on a similar project?	To see if there are any insights that might be more widely applicable.
	What feedback have you received so far?	User ratings in app stores (if applicable). How many downloads have there been (if applicable). Comments from users, partners or staff?	To determine what quantitative/qualitative date may be available and what user reaction has been to the project/service.
Staffing	What has been the reaction from staff to the project?	Was there any resistance to the idea? Were staff enthusiastic from the start? Were there any skills/training that staff needed which they didn't have?	To determine how far staff have been involved/enthusiastic about the project/service.
	If you were recruiting new staff to the service now, has the project affected what skills or attitudes you would be looking for in new recruits?	How far would staff have to have these skills/attitudes when they are employed? How much would in-service training be able to address any skills gaps?	To find out whether the use of mobile technology is likely to have an impact on the requirements of professional training or recruitment of staff.
Future	How will the project/mobile service be updated or sustained?	How often will the content need to be updated? Who will carry out any future updates? Have future technological developments been considered? How will any updates be funded?	To see how far the project/service is sustainable and whether it is a one-off service that, in effect, will be 'preserved in aspic'.

	Are there any (other) mobile-related projects that you'd like to do in the future?	What is the likelihood that these will happen? What would be the benefits? What might prevent the project from going ahead?	To find out potential directions of travel and future trends, as well as potential restrictions on development.
	Do you think the current financial climate is affecting the use of mobile technology in the sector?	How far is there room for innovation when many services are struggling to keep the basic service going?	To acknowledge the current financial difficulties of most organisations and see how common is the attitude that we can't afford to innovate, compared to the attitude of not being able to afford **not** to innovate.
	Do you think there will be any changes in user expectations in the future as regards mobile technology and heritage organisations?	Will it matter if organisations don't have mobile-friendly websites or apps? Is it something that's just nice to have as an extra or is it likely to be an integral part of the service in the future?	To obtain a sense of how important a role for mobile technology people see in their organisation's future.
	If you were asked to speak at a conference on mobile technology and museums/libraries/archives, what would be the main points you would make?	What would you say to developers? What would you say to any other heritage professionals about to embark on a mobile project/service development?	To see what people pick out as their main points and how far these would be positive or negative.
Any other comments?	Is there anything else that you think is important regarding mobile technology and archives, libraries and museums?		To give interviewees the opportunity of raising any items of significance to them that we haven't previously discussed.

Appendix 5: Case study questions for developers

CASE STUDY SEMI-STRUCTURED INTERVIEWS – questions for developers

Theme	Question	Probing questions	Rationale
Introduction	Explanation of the research and that we are talking about mobile devices such as phones/tablets, not netbooks. Please can you confirm that you've received the information sheet about the research and that you're happy to participate in this interview? Do you agree to the interview being recorded, as outlined in the information letter? Do you wish your contribution to be anonymised or are you willing for you organisation to be identified in the final report?	I will send you a copy of the transcript of the interview so that you are able to make any corrections. You remain free to withdraw your participation at any point. *Signing of consent form (if not already signed in advance).*	Compliance with research ethics requirements. Ensuring interviewee understands purpose and context of research, and their right to withdraw consent at any time.
	Please tell me your job title and outline your main role and responsibilities?	Who do you report to? How long have you been in the role?	Background information to establish individual's position in the organisation and their main responsibilities.
Strategy	Can you describe to me what your organisation has been doing with mobile technology?	How did it come about? Who thought of it? Why was mobile chosen? Were any alternatives considered? Is it something completely new or an extension of an existing service/project? Is it part of a larger project?	Scene setting, and to hear the interviewee's summary of activity. I want to determine whether a strategic approach was taken and how far it was top-down/bottom-up, opportunistic/pragmatic, driven by developers/cultural heritage organisations/parent organisations.
	Has there been any	Have	To establish whether the

	demand for this from users?	customers/potential customers of your existing products asked for mobile apps, web apps, or other mobile technologies?	introduction of mobile services is developer-driven or customer-driven.
Product	If have an app: What's the purpose of the mobile product? If don't have an app: what potential do you see for your company developing a cultural heritage mobile app/web app?	What do you hope to achieve? Who is the target audience? (Remote users? Physical visitors? Non-users?)	To determine what the aims of the project/service development were at the outset and what was conveyed to the developer.
	Do you know how your customers have funded their purchase(s) of your product? Has it been through external project funding? Have they teamed up with other partners to share the cost?	How much would you say it would typically cost to develop a native app? A web app?	To see how far developers are aware of their customers' financial arrangements.
	A number of suppliers of library management systems or content providers are providing apps based on their products that can then be customised to individual libraries. Do you think this same approach would work or is likely to happen with archives and museums?	Why? Or why not? What makes archive and museum collection management systems different from library catalogues?	To find out how far software suppliers to museums and archives may take a 'template' approach to development of solutions for their customers.
	Is your product accessible to people with a visual or hearing impairment?	Have these disabilities been taken into account in the design of the product?	To find out whether any assessment of accessibility has been considered.
	Can you tell me about anything that didn't go as expected or that you wish had been done differently?	What were the main learning points? What advice would you give to someone embarking on a similar project?	To see if there are any insights that might be more widely applicable.
	What feedback have you received so far?	User ratings in app stores (if applicable).	To determine what quantitative/qualitative

		How many downloads have there been (if applicable).	date may be available and what user reaction has been to the project/service.
Staffing	Do you think existing archive/library/museum staff have sufficient skills and knowledge to take advantage of mobile technology and the potential for their services?	What has been the most common response to the introduction of your mobile product? What range of responses have you received?	To determine how far staff have been involved/enthusiastic about the project/service.
Future	Are there any (other) mobile-related projects that you'd like to do in the future? How do you think your product(s) might develop?	What is the likelihood that these will happen? What would be the benefits? What might prevent the project from going ahead?	To find out potential directions of travel and future trends, as well as potential restrictions on development.
	Do you think the current financial climate is affecting the use of mobile technology in the cultural heritage sector?	How far is there room for innovation when many services are struggling to keep the basic service going? Will this of necessity be linked to externally-funded projects?	To see if developers are aware of current financial constraints affecting customers and whether this is a significant factor in take up of products/services.
	Do you think there will be any changes in user expectations in the future as regards mobile technology and heritage organisations?	Will it matter if organisations don't have mobile-friendly websites or apps?	To obtain a sense of how important a role for mobile technology developers see for cultural heritage organisations in the future.
	If you were asked to speak at a conference on mobile technology in the cultural heritage sector, what would be the key points you would make?	What would you say to other developers? What would you promote to customers as the main benefits?	To see what people pick out as their main points and key benefits.
Any other comments?	Is there anything else that you think is important regarding mobile technology and archives, libraries and museums?		To give interviewees the opportunity of raising any items of significance to them that we haven't previously discussed.

Appendix 6: Sample coding of case study transcript

INTERVIEWEE 1: I think it would be of great appeal to both site-based students and distance learners. The fact that it could help them learn flexibly. It wouldn't be the be all and end all, I'm sure, learning through your phone, but it would allow them to access, on the move, material, regardless of where they were.

Comment [WU57]: Benefits to users

TW: What do you think might prevent it from going ahead?

INTERVIEWEE 1: Institutional priorities and funding.

TW: Do you think there are any implications of the current financial climate on cultural heritage organisations embracing mobile technology?

INTERVIEWEE 1: Do I think that mobile would be hardest hit in a financial crisis?

TW: It's whether everyone's so concentrated on just surviving that the idea of mobile is just impossible. Or whether it's because we've got to survive, we've got to embrace mobile. There's two ways of looking at it.

INTERVIEWEE 1: I don't know. I think it's regarded as a nice extra by the [name of organisation]. I don't think it's part of its core business. We have had a downturn in visitors this year because of the Olympics, I think. Were the project not funded externally, then I doubt it would still go ahead if it was down to funding from within the organisation itself so, yes, I think it has an effect on whether an organisation feels adventurous enough because it involves unknowns in terms of return on investments.

Comment [WU58]: Funding; sustainability

Our project cost £500,000 in total - it wouldn't cost that much to produce an app by a single organisation, but there's all sorts of whistles and bells attached to our project. But if an organisation, which largely gets its income from visitors at its properties, was faced with a downturn in numbers, I don't think it would really gravitate towards mobile technologies, simply because there aren't demonstrable returns on investment at the moment.

TW: Do you think it will matter in the future if organisations don't have mobile-friendly websites or apps?

INTERVIEWEE 1: Yes. There has been a great uptake in mobile devices and lots of our visitors have them. I think there will be an increased expectation as mobiles get better, because I think we're at a certain point in the development of mobile technologies, and as connectivity gets better, people will use their mobile device more so organisations have to respond to that. I can't see that changing. The rise of mobile phones has been exponential almost. And apps, for the foreseeable future, are a way of using your phone's computer in a streamlined way.

Comment [WU59]: Mobile-friendly website

TW: If you were asked to speak at a conference on mobile technology in the cultural heritage sector, what would be the key points you'd want to make?

INTERVIEWEE 1: Did you see my talk to [name of conference]?

TW: Are those the slides on SlideShare? Yes, I have seen those.

INTERVIEWEE 1: Yes. My main point there was using digital technologies to create opportunities for people to do things they want to do anyway. Or to create something unique. A unique value proposition would be the phrase. That would encourage people to

Comment [WU60]: Rationale